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* Profit Sharing.

BY C. S. PRIZER.

WOULD not every progressive stove manufacturer welcome the inauguration of a policy in the management of his business that, without diminishing his profits, would assure to him the best and most faithful service from his employees of which they are capable? If, at the same time, this policy would promote friendly and sympathetic relations between his employees and himself, and would cause his employees to feel the same interest in the quality of the product and the prosperity of the business which he himself feels, would not every stove manufacturer adopt it? The advocates of that modification of the wage system known as profit sharing, make the following claims for their scheme, when applied to manufacturing industries:

That it will increase the quantity of the product.

That it will improve the quality of the product.

That it will promote economy and care in the use of materials and tools.

That it will prevent strikes and labor difficulties.

That it will effect an improvement in the character and conduct of the workmen.

That it will reduce the expenses and obviate the difficulties of superintendence and inspection.

That by reason of the increased product and of the economies resulting from the operation of the scheme, there will be created an extra profit beyond the profit that could otherwise be earned by the business.

Profit sharing may be briefly defined as any system under which the employees of a business house receive, as a bonus, at stated intervals, a part of the profits of the business in addition to their stipulated wages.

The basis and methods of this distribution will be determined by the varying conditions of different industries. In fact, an investigation of the leading examples of profit sharing in this country and in Europe show no two cases in which the plans of distribution are identical. The advocates of profit sharing assert that no employer should consider that his own profits will be diminished by the distribution of a bonus to his workmen. They insist that the system must stand or fall on the proposition that under profit sharing, the workmen create an extra profit over and above the profit that could otherwise be realized. It is a part or the whole of these extra earnings created by the system that is to furnish the fund for maintaining it. Participation in profits by workmen was first advocated by Turgot, one of the early French economists, in 1775. He claimed, as do modern advocates of the scheme, that it would furnish a powerful incentive to workmen for the rendering to their employers of faithful, thorough and conscientious service. The plan seems never to have been put into practice, however, until M. Leclaire, a Parisian house painter, applied it to his business with marked success in 1842. Since that time, up to the year 1892, according to Mr. Nicholas P. Gilman, profit sharing has been adopted by about 300 establishments in Europe and America. About 100 of these cases are credited to the United States, but the records show that a number of houses in this country have abandoned the scheme after trials varying from one to eight years. Among the establishments noted by Mr. Gilman as having the plan in successful operation in this country are:

*A paper read before the National Association of Stove Manufacturers, May 4th.

The Century Co., Publishers, New York.

Pillsbury Flour Mills, Minneapolis.

Rogers, Peet & Co., Clothiers, New York.

Globe Tobacco Co., Detroit.

Haines, Jones & Cadbury, Brass Goods, Philadelphia.

Proctor & Gamble, Soap, Ivorydale, O.

Yale & Towne Manufacturing Co., Locks, Stamford, Conn.

Rand, McNally & Co., Publishers, Chicago.

J. W. Tufts, Soda Water Apparatus, Boston.

Rumford Chemical Works, Providence.

N. O. Nelson Manufacturing Co., Brass Goods, St. Louis.

The only instance of profit sharing in the stove business, so far as I can learn, is that introduced by the late M. Jean Baptiste Andre Godin in the management of his foundry at Guise, France, in 1877. M. Godin is said to have been the first manufacturer in France to substitute cast iron for sheet iron in the construction of stoves. His experience in profit sharing seems to have been eminently successful, though his plan for distributing the bonus is quite elaborate and complicated, as the following account of it will show:

"The profits of the year's business, after allowance is made for operating expenses, are subject to these deductions: First, a charge of 10% on the value of movable property, and another of 5% on the immovable property, for depreciation; second, 5% interest on capital; third, a certain amount for the educational privileges provided by M. Godin for his employees in his famous Social Palace, and fourth, a sum equal to 2% of the wages and salaries of the year for the benefit of a pension fund. The net profits remaining are then divided as follows:

"The reserve fund receives 25%; a second 25% goes to the management, and the remainder is allotted to capital as a super-dividend, and to labor as a bonus on wages. The usual interest on the capital of the establishment, and the whole amount paid out during the year in wages and salaries are added together. The proportion each sum bears to the total amount determines the respective shares of labor and capital. Thus, in 1880, interest amounted to 230,000 francs, and wages to 1,888,000 francs. The bonus to labor was, accordingly a little over eight times the amount of the super-dividend to capital. The workman does not receive any part of his bonus in cash. It is all capitalized and applied to the purchase of shares in the business. No workman is admitted to participation who is not already the owner of one share of stock. All workmen, however, are encouraged to purchase stock. The interest on the stock held by the workmen adds considerably to their average earnings. In 1883 the house employed over 1,400 workmen, of whom 793 were owners of stock, and hence participants in the bonus dividend. It will thus be seen that there is at work in this business an evolution which will finally result in a co-operative establishment."

In nearly all of the recorded examples of profit sharing, the workmen are paid but a small portion, if any, of the bonus in cash. The bonus is usually invested in a pension fund, applied to the purchase of an interest in the business, used to effect an insurance policy or to purchase an annuity which shall be available when the workman shall become superannuated by old age or illness. In nearly all cases the benefits have been made to accrue only to the more important and efficient workmen, and to those only after they have been in the employ of the house for some stipulated period.

For those employees who believe that profit sharing constitutes a solution of the ever present labor problem there is the encouraging consideration that, unlike many other proposals for the settlement of this question, the plan can be carried into effect without legislative action and without securing the assent of a majority of the voters of the country. Each employer can test profit sharing for himself, beginning, if he so desires, in a tentative and experimental way, and extending the scheme as its success may warrant.

Should any member of the National Association of Stove Manufacturers de-

sire to inaugurate a system of profit sharing, I venture to offer a few suggestions as the result of my investigation of the subject.

Let the management, at the close of any business year, announce to as many of its employees as it deems advisable to admit to the scheme, that in order to secure their full and sincere co-operation for the success of the business, it is proposed to divide among them, in proportion to their respective earnings at the close of the ensuing year, all of the surplus profit which it shall appear is due to their increased faithfulness, vigilance and efficiency. While this announcement to the employees should intimate that a fair and equitable method would be adopted for determining this surplus profit, the details or the method actually adopted for determining it should not be divulged to them, as the entire matter should be completely at the discretion and under the control of the employer. A number of experiments in profit sharing have failed because of differences between employers and employees regarding the amount of bonus and the method of distributing it. Apply the plan to those employees who have been with the house for two years or more, in the following departments: Molding, mounting, pattern, electroplating, polishing, machinery, engine, selling, office.

Allow each employee the option of receiving his bonus in cash or of applying it to the purchase of stock of the company. If necessary, arrange for the issuance of stock certificates of small denomination, in order to afford employees a better opportunity for acquiring a capital interest in the business.

The difficult feature of any plan of profit sharing which contemplates the distribution of an indeterminate bonus, is to estimate the increase of profit which has resulted from the operation of the plan. Various methods of estimating this increased profit will suggest themselves to the convert to profit sharing. The average profits, in percentages, of a number of ordinary business years, might be taken as a basis, and the profit of a year under the profit sharing system in excess of such a basis, might, taking into consideration the conditions prevailing during that year, be assumed to be due to the operation of the new plan. A more definite plan of distribution of profits to employees might be adopted by any stove manufacturer who is not afraid to take the full plunge into the policy of profit sharing. Out of the profits of the business, a definite percentage might be first paid to the stockholders of the company. As much of the net profits beyond that as it is deemed feasible to pay out in a cash dividend might be divided equally, or in any other proportion, between the stockholders and those employees who are admitted to participation. Of course, any plan of profit sharing contemplates, before it is inaugurated, the existence of a profit at the close of the year, and I have therefore to confess with regret, that there are a great many stove manufacturers in the United States who, for an obvious reason, are not now and have not for many years been in a position to begin a trial of this beneficient scheme.

The current objections to profit sharing, so far as the literature of the subject reveals objections to it, may be summarized as follows:

If workmen are to participate in profits in good business years, they should also hold themselves ready to help make up losses in years of bad business, by paying back at the close of the bad year a proportion of the wages they have received.

Profit sharing on these terms would be manifestly impracticable. If workmen are once permitted to share in the profits of a concern they will soon insist that they be permitted to audit its books and accounts.

Profit Sharing would result in undesirable publicity regarding the profits of a company.

If profit sharing is so sure to result to the advantage of both employer and employee, why has it not been more generally adopted? After having been tried for many years in isolated cases, the number of houses practicing it is so small as to constitute an almost infinitesimal point in the immense world of business.

Profit sharing is merely a dream of

idealists and philanthropists, and therefore not adapted to this hard and practical world. Profit sharing would, if generally adopted, and if the result claimed for it were realized, put workmen at the mercy of the managers. A good business manager would so conduct affairs as to be able to pay a bonus to the employees; a poor business manager whose employees worked just as faithfully as those in the former case, would not be able to realize a bonus for them.

It seems to me that these objections are trivial and superficial. If nothing stronger can be urged against profit sharing, the advocates of that industrial policy have a stronger case than have its opponents. Workmen would receive the current wages without deduction even if they had not been promised participation in profits. If no profit is realized, their extra exertions due to the hope of receiving a bonus yield them no pecuniary reward.

Very few investing stockholders ask permission to audit the books of the house in which their capital is at stake, and it is therefore unlikely that workmen without any capital invested in the business would do so. That profit sharing has not been widely adopted does not prove the policy to be without merit. A strong force is required to overcome the inertia of habit, tradition and custom. It is no argument against any proposed innovation to call it an impracticable dream. Every man who has ever proposed "a better way" in any department of human activity has at first been charged with impracticability. Neither is it any argument against profit sharing to say that an incompetent manager will not be able to distribute as large a bonus to his workmen as will a capable manager. Under the present system the prosperity of the workmen is also inseparably linked with that of the establishment for which he works.

There are, however, fundamental reasons why profit sharing cannot fulfill the sanguine predictions made for it by its partisans.

Von Thunen believed profit sharing to be "the only refuge and salvation of the working classes." Sedley Taylor, the learned English economist, gives the policy his unqualified support and asserts that its general adoption would result in great and permanent benefit to the mass of laboring men. Francis A. Walker says: "That profit sharing, if generally introduced, * * * * * would be a cure for most of the labor troubles from which we suffer, seems to me beyond dispute." N. P. Gilman says: "Profit sharing is the one most practible and most generally applicable measure (in the settlement of labor difficulties)." F. H. Giddings, a rising American economist, asserts that "profit sharing effects a more equitable distribution than can be realized by the unmodified wage system."

The American Association for the Promotion of Profit Sharing includes in its roll of officers the names of such well-known and practical men as Carroll D. Wright, N. O. Nelson, of St. Louis; Alfred Eolge, of New York; Henry R. Towne, of Stamford, and George A. Chace, of Fall River. Yet, notwithstanding, the weight of authority given to this movement by the able and eminent men who are engaged in promoting it, I am convinced that we cannot hope to find in profit sharing even a partial cure for the economic maladjustment of which the "labor question" is a symtom. In the cases where profit sharing has been successfully applied, the scheme has usually been carried out and reported upon by men of exceptional executive and administrative talent, who had strong prepossessions in its favor before inaugurating it. Were profit sharing applied to every productive and distributive industry, it could not raise actual wages or improve the condition of those who toil. For, assuming that it will do all that is claimed for it in increasing the product and promoting the industry of workingmen, it is merely equivalent to inventions and improvements which augment the efficiency of labor.

If the improvements and inventions which add to the power of labor could cure the economic ills that afflict us, we should long ago have reached an industrial millenium. Inventions and improvements that facilitate production are so far from constituting a solution of the labor problem that so close an

observer as John Stuart Mill could say: "Hitherto, it is questionable if all the mechanical inventions yet made have lightened the day's toil of any human being."

An example of the failure of profit sharing to permanently raise wages is furnished by the history of the co-operative coopers' associations of Minneapolis. At first, all of these associations made money by eliminating the middle man, and by effecting various economies in the manufacture of flour barrels. In his account of this interesting group of co-operative establishments, Dr. Albert Shaw naively intimates that the co-operation itself was a marked success, but owing to a constant and unfortunate downward tendency in the price in barrels, the workmen in these shops who were all profit sharers, had finally to be content with the most meagre returns for their labor.

That profit sharing has been applied with some degree of success in a few isolated cases, is no proof that it would raise actual wages or increase profits if it were generally adopted, even assuming it to be as great an improvement as its advocates would have us believe. An improvement in machinery or in business methods may be an advantage to a house so long as the improvement is confined to that one house, but the advantage is lost when the use of the improvement becomes general. When reading and writing were rare accomplishments, the ability to read and write conferred distinction and had a money value.

It is impossible to raise wages above the point to which they gravitate under given economic conditions, by any system of bonuses or premiums. When the English government, attempting to mitigate the distress of underpaid agricultural laborers, paid out of the public treasury "grants in aid of wages," it was found that the recipients of these grants merely offered to work for that much less.

The advocates of profit sharing exaggerate what they term the "defects fo the unmodified wage system." The assumption that a mere employee has little or no incentive to faithfully serve his employer, is, I am confident, contradicted by the experience of every manufacturer in this meeting. An employee can usually promote his own welfare by conscientiously performing his duty toward his employer. The majority of workmen, in the stove business at least, instinctively put forth their best efforts to advance the success of the business.

Traveling salesmen could hardly be imbued with additional ambition or energy by the most liberal application of the profit sharing plan, as almost every traveling salesman knows that his remuneration depends directly upon the amount and quality of his work. The salesbook is a strict and vigilant superintendent. Yet traveling salesmen do not, on the average, render any better service than the other employees of a manufacturing establishment.

It is doubtful whether the application of profit sharing in the industry of stove manufacturing would appreciably increase the propuct or improve its quality. The molders and the mounters, who comprise a majority of the force actually engaged in the work of making the goods in this industry, are turning out as large a quantity of product as can be expected of them. It is certain that the molders at least, could not on the average, turn out more work than at present, without to some extent sacrificing health and longevity. That the piece workers in this industry do not, and need not, sacrifice quality by turning out a large quantity of product, is proved by the fact that the goods of a well-known house which probably turns out more stove plate per molder than any other in the country, are unsurpassed in excellence of workmanship and finish.

That a pecuniary interest in the success of a business does not have the magic and marvelous effect upon employees with which it is credited by the advocates of profit sharing, is shown by an example that has come under my own observation. In this case a number of employees hold small amounts of stock in the company. Neither in the quantity of the work produced, nor in its quality, do these stockholding employees show any noticeable evidence of superiority to

the average workman who has no capital invested in the company. I do not wish to be understood, however, as opposing the policy of encouraging employees to invest their savings in the stock of the company for which they are working. On the contrary, I believe that policy to be a good one, so long as the house is able to declare dividends, as it has a tendency to promote reliability and reasonableness among the men.

While it seems certain to me that we cannot hope to find in profit sharing even a palliative for the evils that in these times so sorely perplex the sociologist and the economist, yet the spirit that prompts such men as Wright and Walker and Gilman to turn to this policy, is noble and commendable.

The fact that demagogues and quacks find their occupation and opportunity in the existence of the anomalous industrial conditions that prevail over the whole civilized world, should not deter thoughtful and conservative men from frankly facing the problems involved in our system of producing and distributing commodities, nor from earnestly seeking a solution of these problems.

Why have the numberless inventions and improvements that so immensely facilitate the production of wealth failed to assure a good living to every man who is willing to work?

Why is it that with boundlesss natural resources, which as yet we have hardly begun to use, vast numbers of men should be denied the opportunity of exchanging their labor for the things that labor produces?

What is the cause of that strange industrial congestion that prevents us from half utilizing the productive facilities at our command?

Why do wages, considered as a proportion of total production, constantly tend downward as the productive power of labor increases?

Why do the majority of business men find it increasingly difficult to secure an adequate return for their capital and labor?

These are the questions we must solve, or all of the splendid achievements of our civilization will finally avail us nothing.

*Cleaning Castings.

BY A. C. MOTT.

GENTLEMEN: Before beginning this subject I wish to say that there is no probability of my saying anything new, or anything that is not already known to most, if not all of you. And that if this article causes any discussion that will bring out the best and cheapest method of cleaning castings, its objeet, I take it, will be accomplished.

Into this subject, like all others pertaining to cleanliness, personality enters to the greatest extent. Some persons are noticeably clean; others the reverse. Some persons have everything clean about them; others the reverse; and with the cleaning of castings as much depends upon the personal disposition as in any other point in our business.

There are foundries in existence that have nothing but the old-fashioned scratch brush, and yet turn out better cleaned castings than those having the most modern machinery. Your castings can be made as clean as you demand they shall be, just as your castings are made of such a standard as you demand, and your inspector enforces. The inspector is, after all, the one person who controls, and it is upon his judgment that you must depend as to whether your castings are properly cleaned or otherwise.

I might say that the first point or place in which you start to clean castings is on the molders' floor; if you use such care in the selection of iron, sand and facing that the sand will not burn to the casting, but will scale easily from it, in fact, so that a goodly portion of the sand is rapped off by the molder, you have accomplished just so much in the cleaning.

The old-fashioned method was to use a wire scratch brush, made of No. 16 to No. 28 wire done up in a mass, with which a man brushed the sand from the casting.

*A paper read before the National Association of Stove Manufacturers, May 4th.

Then mills came into use, which were made a hexagon or round form, either of iron or wood, and each mill driven by its own belt from shafting suitably placed. The castings were packed immovably in these mills with small shot iron placed between them, and the movement of these shot when the mill was revolved, rubbed the sand from the casting.

Since then they have experimented with square mills, and some claim for them great advantage, as they are much easier packed, and more work and larger castings can be placed in them, and with much less liability of breakage, and with generally better results in cleaning.

Of late years, however, they have introduced great improvements in this respect, in the form of sheet steel mills running on hollow spindles. The outer cases of these mills are perforated, not to allow sand to escape, but to allow air to enter, which is drawn in by a suction fan so placed as to suck the air through the openings in the outer shell, which carries the dust and sand through the spindle, and forces it through proper tubing, and deposits it at any given point desired.

In these mills they use small star shot made of exceedingly hard iron, which are known by the name of steel shot.

These have five or more points with sharp edges which enter into all deep carving and interstices, when the mill is not too closely packed, and the dust is drawn away by the fan and the castings come out exceedingly clean, and if run for any length of time, the rubbing of the shot brings the graphite carbon in the iron to the surface, thereby making a very high polish which, when touched with the hand, comes off with all the effect of black lead.

These mills are so made that they can be run in couples back to back from one shafting, and are started or stopped by a friction clutch, and in some cases they are so arranged that as high as four couples or eight mills are run in the same form. The only drawback I have ever heard in regard to these mills is the sand getting into and cutting the

There is also a class of mills known as churns, which do most excellent work. They are cheap and, in the writers opinion, exceedingly profitable. These mills should be placed over a pit, or cellar, walled in so as to retain the dust and dirt. Preferably those should be made large enough to contain a week's supply of sand, with openings at bottom for the bearings of the machinery, thus causing considerable expense for repairs.
purpose of removing the same. A driving shaft is made long enough to carry ten or less of these churns. On these are placed flanged wheels about 8″ in diameter made with chilled face. A loose shafting extends over the length of one mill, which is made say 30″ long and from 10″ to 24″ in diameter, and bearing wheels placed to match those of the driving shaft, the top of both sets of wheels running level with the floor. The mill is made so that the heads of the mill rest upon the wheels and is driven by friction. The mill is rolled off these bearings on to the floor, opened and packed. When I say packed, I mean the castings are put in loosely. The shot used are star shot, and are never removed. The mill is closed up, rolled on to the friction rolls, started and allowed to run for one, two, or three hours, or such time as is necessary to clean the work. The expense of running is very small, consisting principally of the lining up of the shaft once a year, while the mill itself will wear from two to five years, and the repair work, outside of the shafting, cuts a very small figure.

These are largely in use in our part of the country in malleable iron shops, hardware shops, etc., and are considered very desirable.

There has also recently been invented an acid, the castings being placed just as they come from the molders' floor in a bath of the same. The acid attacks the sand rather than the iron and it is claimed simply scales the castings without eating into the iron. For some character of castings, this would seem highly desirable.

I do not think it is necessary in this article to describe or consider the sand blast methods of cleaning, as they have have been tried and found wanting, and

I do not know of anyone who has tried this system who has it in use at the present time.

This covers what is generally known as the cleaning of castings, and I believe covers all I was requested to speak of in this respect, but I consider that the cleaning of castings extends much further than the mere brushing off of the foundry sand which adheres to it, as under the head of the cleaning of castings comes the counting and inspection of the work.

There are some shops that count the work in the gangway in front of the molders' floor, and that discount from the cleaning room after inspection, and this method has its advocates.

Another method is to count the work after it is cleaned; that is to say, the work is carefully sorted, all the plates belonging to each stove being placed in separate piles, and inspector or ware boss counts the parts and the molder receives credit from this count.

Still another way is not to count the work at all; simply clean it and put it on the work room shelves. When the stove is mounted, the molders making this stove are credited with the number of parts of their work required to mount the stove. To illustrate: The No. 8 Starlight Cook Stove is in the sand. It is divided among four molders, and they make four stoves of their part. Molder A's parts amount to .96 for one part; Molder B's, .87; Molder C's, .91; Molder D's, .90. When the mounter takes the work from the shelves to mount say eight stoves, Molder A is credited for 8x.95, $7.68; Molder B is credited for 8x.87, $6.96; Molder C, 8x.91, $7.28; Molder D, 8x.90, $7.20. This seems to be a perfectly fair method as it requires the molders to make their work even, as no work is counted unless it is even. Where odd work is required under this system, it is taken from the shelves, notification being given the foreman, who sees that the extra parts necessary to even it up are made, the molder being paid for such extra parts.

While this plan works very advantageously to the manufacturer and also to the molder, yet the feeling exists that he is not getting paid for what he does, especially when the end of the week comes and he has parts left on the shelf, owing to his partners on the job not having their parts even with him. Yet the experience of those who use this system shows that molders receive as good wages by this system as by any other; the disadvantages, if any, being to the manufacturer, caused by forcing work through to keep the stoves even.

That the cleaning of castings cuts a very large figure in the general results of the manufacture, I would state that I have known parties making first-class stoves, as far as molding, mounting and trimmings were concerned, but they were careless in their cleaning, and I have heard dealers say, "Why, their stoves are of no account; they do not even brush the sand off their castings."

After the castings have been cleaned in any of the manners aforesaid, there are many of them that require to be nickel plated. These are placed in mills of the exhaust character and remilled with sharp, new star shot, and thus made absolutely and positively clean and ready for the polisher. This method, which I think is generally used, is probably the cheapest method possible. This would cover the cleaning of them for japanning as well.

There is also a water mill very largely in use, which is used to polish small castings, such as turn-keyes, shakers, lifters, etc. The mills are made of the cylindrical form, with a man or hand-hole through which to place the castings, and which is closed with gum gaskets, in the same way as the man or hand-hole of a steam boiler. Being water-tight, water is placed in them before closing together with sandstone spalls, or small pieces of granite.

Others make these mills in an egg shape in two pieces united at the center, where they are not tight, and run them in a tub of water, the water entering the crevices in the center and the castings being, by the shape of the mill, thrown outwardly and then inwardly, receive their polish in this way.

Either of these forms of mill do good work. The castings, to fit them for nickeling, should be allowed to remain in the mills and kept moving from

two to six days, according to the character of the work.

Castings which require to be nickel plated also require buffing, and as grease is used on the buffing wheels, it often deposits on the background of the castings, requiring them to be cleaned. Soft soap and hot water is probably the best method for cleaning these. We have tried many cleaning compounds, articles which are much more expensive, but find the above is preferable.

In conclusion I would state that a sufficient quantity of mills—that is, enough so that the work can be kept in them long enough to become properly cleaned—is highly advisable, and it is of the utmost importance that work should not be removed until it is absolutely clean, thus saving the expense attending upon the handling and re-handling of the work, which would otherwise be necessary.

MORAL: Put up more mills than you want, and good ones.

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*The Advantages and Disadvantages of Interchange of Information and Experience Between Stove Manufacturers.

BY FULLER & WARREN CO.

THAT a free and full discussion of methods employed and a frank interchange of data concerning every branch of the stove business would be of advantage to all members of this association seems entirely reasonable. Indeed it can hardly be questioned, except on the supposition that the exchange of ideas would not be frankly done by some, or else that the burden of imparting information would come heaviest on a few whose knowledge is greater than that of the many. As to the first objection, while it is probably true that some would be only too willing to profit by any valuable ideas received while either refusing to impart anything valuable themselves, or doing it in such a manner that it would be of little value, it may be assumed that most people are not of that disposition and, therefore, any objection to interchanging data because of them would be many times offset by the advantages to accrue to the great majority, who, it is fair to presume, would be candid in giving as well as receiving information. The other supposition that a few might give to the many without a fair return, is also not a good objection. For while it is true that in all bodies of men there are some who, because of superior knowledge, have more to give than they can receive from any other individual, it is more than probable that they could gather as much information from all the others as they themselves would be able to give.

By a full and free discussion of methods and a frank interchange of data is not meant merely the discussions that occur at these annual meetings, but a willingness between individual members to exchange or give at any time when requested to do so, any data asked for regarding methods used in manufacturing and selling goods and collecting accounts. A knowledge of what your contemporaries are doing in manufacturing cannot fail to be of advantage; and this is so, not because you may wish to use it against them, but because it sharpens your desire to be up to the times, makes you strive for new and better ways of working, and in fact, gives you an interest and pride in your business that never comes to the man that goes along doing things in his own way, without the incentive that comes from contact with other men and methods.

And it is not only as a means of education that an interchange of ideas would be valuable, but it would really be a protection against unjust demands that cannot be refused unless you can learn positively what your fellow manufacturers are doing. In your manufacturing departments, it would protect you against payment of excessive prices for labor, for men cannot reasonably continue to ask one manufacturer to pay more than another for the same kind of work. This may seem to those who are not at present paying as great prices for labor as some others an unnecessary reason in their case for reciprocity, but they may rest assured it applies as

*A paper read before the National Association of Stove Manufacturers.

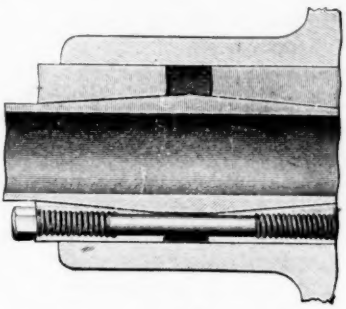
closely to them as to their less fortunate fellows; for the associations of their workingmen you may be sure do not withhold from each other any data that will enable them to secure advantages, and the time will surely come when it will be necessary for the low-paying manufacturers to meet a demand for advances to equal the prices paid by others, and then, to save themselves from paying more than the others, it will be quite necessary for them to know what the others are doing.

In your selling operations it would protect against unwarrrnted attacks on prices and terms by the retailer. As it is now, the retailer has the manufacturer entirely at his mercy. He can, if he is unscrupulous, tell the salesman anything he pleases about terms offered by other manufacturers and the salesman in many instances, is obliged to be guided by the retailer's statements. Would this be so if the members of this association were willing to exchange information with each other? Would the continual increase in length of terms go on?

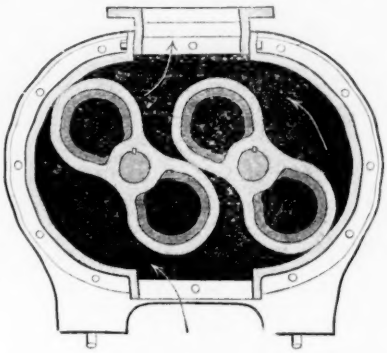
It is not the intention to make this a long paper and as you are all probably familiar with such subjects, no more space will be given illustrating it. The fact seems so clear, however, that an honest interchange of data among the individuals of this association would be of advantage to all, that it is earnestly hoped the discussions that may follow will be potent to accomplish something in the direction of an "Interchange of Experience Between Stove Manufacturers."

The Root Blower.

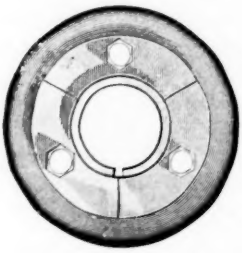
FOR a very large number of years the very name of Root Blowers would seem to be a familiar one in the foundry world of this as well as of other countries, this condition of affairs being brought about largely by the positive pressure system inaugurated and adopted by them. Their blowers have on many occasions been improved in many ways, the latest among others being a bearing consisting of a phosphor-bronze sleeve which is tapered outside from the middle to both ends. The sleeve is slotted entirely through the metal at the top and almost through at the points on the side of the sleeve where the iron segments meet. By this arrangement the sleeve presents an entirely smooth surface to the journal at all times, and if any wear takes place the metal will readily yield to the action of the iron wedge when forced into the box. Six



iron segments or wedges are turned up straight on the outside to correspond with the housing of the box and bored



inside to the taper of the sleeve. These segments are inserted from both ends



of the box and are controlled by three adjusting screws, as shown. If the wear

takes place in the bottom of the bronze sleeve, the lower wedges are forced in sufficiently to take up the wear and bring the journal to its original central position.

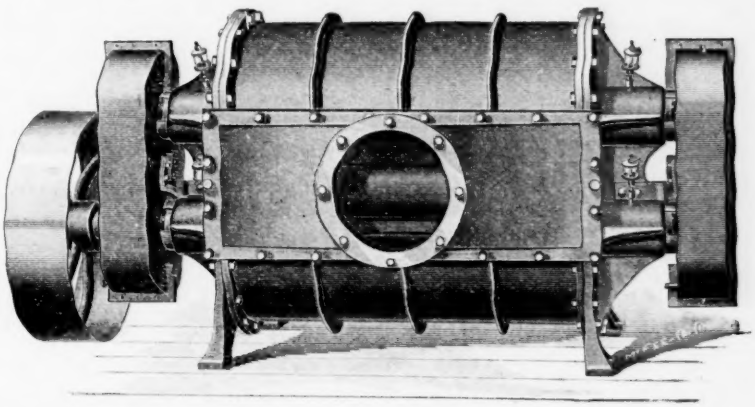
The wear is taken up in any other part of the box in the same manner, and it is apparent that no endwise movement of the bearing is necessary in taking up wear.

The space between the ends of the wedges in the middle of the box is utilized as an oil chamber, and the journal continually runs in oil, this, with the facilities for adjustment, making a box which the makers expect to prove well adapted to this service.

The blower case originally adopted by them 35 years ago was used up to 1885 when the present style was adopted, but on account of the adoption of new journal boxes they have returned to the o'd-style case with few modifications, such as the arrangement for putting on the pipe plate, which is the same arrangement adopted by them with their rotary pumps. The ribs have been added to the cylinders to insure greater rigidity and strength. The cross section of blower shows their latest improvements in the way of a true curve impeller, upon which patents are now pending and which, it is said, are best adapted to high pressure and pneumatic tube work.

They claim their 35 years' experience in the blower business will enable them to make a machine as nearly perfect as possible, and they have also recently designed and put into use special machines calculated to turn out certain parts of their blowers more promptly and more perfect than ever before.

The accompanying illustration shows the outside view of their latest improved blower, section and cross section of journal bearing, as well as cross section of blower itself.



A Handsome Foundry.

A REPRESENTATIVE of THE FOUNDRY was recently shown in Columbus, O., something in the way of a handsome new foundry building.

The P. Hayden Saddlery Hardware Co. is building a new shop 65x125 feet for heavy work, to be equipped with all modern conveniences, such as electric cranes, improved cupolas, etc. The interesting feature of the structure is, that it is being erected entirely of fireproof material, the outside being faced with enamel rock-faced brick, giving a beautiful and rich effect seldom considered feasible on account of its cost, for even fine residences.

The roof will be of steel truss construction covered with roof tile.

Among the recent cupola shipments of the Detroit Foundry Equipment Co., are the following: Fair, Williams & Co., Dubuque, Ia.; Scottdale Iron and Steel Co., Scottdale, Pa.; Pittsburg Heating and Supply Co., Pittsburg, Pa.; Crescent Brass and Iron Works, Detroit, Mich.; Ranker & Fritsch Foundry and Machine Co., St. Louis, Mo.; Wm. Stormont, Ottawa, Ill.

Defects in Car Wheels.

BY ALEX. CAIRNS.

FIGURE 1 shows an illustration of an ordinary car wheel molded and cast "out of level."

It is evident that on casting this mold the iron will naturally lay or settle to the right side of the chill, at *c*, and in contracting it will shrink away from the

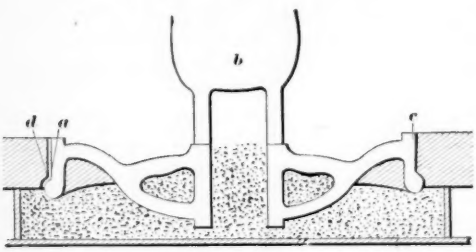


Fig. 1

chill on the left and present an appearance much like that shown at *a*, Fig. 1, and *a1*, Fig. 2. Now, a chill crack will occur on the left of the casting at *a*, Fig. 1; first, from the pressure of the iron in the head *b*, and second, from an unusual or rapid shrinkage on the side of the casting at *c*, due to the close contact of the casting and chill, which will tear the weak side of tread at *a*. Hence it is

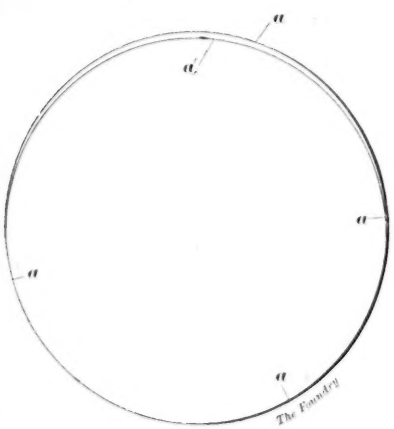


Fig. 2

conclusive that a chill crack will not occur on the lower or right side of the casting, as stated by some writers, but on the opposite side at *a*.

It is evident also that the part of tread on the right, from its longer or closer contact with the chill, will be harder and show a greater depth of chill than would be the case with the opposite side.

Lack of roundness is caused from casting molds which are not level. *A1*, Fig. 2, shows approximately the amount the wheel would be lacking in roundness if cast in the manner shown at Fig. 1, and if cast level the pheriphy of the wheel would be perfectly round, as indicated at *a*, *a*, *a*, Fig. 2.

Sweating in the throat also occurs largely from unlevel molds, and in this instance would occur at *d*, Fig. 2, from the pressure of the head *b;* it is also caused from the iron being too soft, together with the fact that the chilling influence of the chill on the iron is least at *d* on account of its being in the nature of a sharp corner.

Dirty treads are due to an excess of loose blacking and dirt in the mold.

Seams on the tread are caused from slow and unsteady pouring; the steadier and faster a wheel is poured, the smoother its face or tread will be.

Car wheels should be poured in not more than 10 seconds, and in as much less time as possible.

"At It Again."

THE FOUNDRY notes with interest that the somewhat notorious concern known as the Hartsfeld Furnace and Refining Company, located sometimes at Newport, Ky., is sending out to the trade, circulars descriptive of a new mixture with the magnificent title of "Bauxsite Aluminum Facing," also a new metal entitled "Nickel-Fern Aluminum Pig Iron."

As we believe we have sufficiently exposed the character of this concern in previous issues, it is not necessary to give space to them here, otherwise than to warn readers of THE FOUNDRY to be sure and get value for their money when dealing with a concern with a reputation such as this one.

Huyett & Smith Manufacturing Co., Detroit, have issued a neatly printed book giving an outside view and the various floor plans of the Manual Training High School, at Denver, Col., which is heated by their system.

THE FOUNDRY

A TECHNICAL JOURNAL DEVOTED TO FOUNDRY INTERESTS.

Published Monthly by

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DETROIT, MICH.

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THE FOUNDRY is issued promptly on the tenth of each month, and will spare no endeavor to furnish valuable news and information to those interested professionally or incidentally in molding, melting, mixing of metals, foundry management, etc. Persons connected with any of these lines of industry will confer a favor upon the Editor of this Journal by sending him news from their section of the country pertaining to the foundry interests, particularly individual theories and experiences of practical value.

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No Reductions in Stove Foundries.

WHILE the industrial atmosphere is and has been for months full of labor disturbances in almost every direction, THE FOUNDRY desires to sincerely congratulate the stove manufacturers of the country for the magnificent record they have made in uniformly maintaining such harmonious relations with their workmen. This result, we feel, can be directly traced to the Stove Manufacturers' Association or the Defense Association, while probably both together have had something to do with bringing it about. At the outset these associations were regarded with the greatest distrust by the employees, and the molders especially were particularly outspoken against them, but we believe they have come to realize their folly and appreciate the fact that they are their best friends.

The Foundry Trade.

THE foundry business all over the country continues to be very poor, and as it not bad enough from natural causes, the scarcity of coke seems to have come at a most inopportune time and has added greatly to the general stagnation. A few concerns here and there seem to be busy, but this is chiefly found to be the case where a line of specialties or some special article is made for which there is a general demand. Foundries that depend on the jobbing trade are the worst sufferers in all cases. The stove shops are not doing on the average more than half the business they were two years ago, and while agricultural foundries seem to be making a little spurt, it is most uncertain, however, and they seem to be carefully avoiding making any stock.

In raw materials it seems safe to think that coke has touched bottom and an advance in price may be anticipated. This is certainly true also in grades of iron, and with an expected advance in freight rates ahead, those consumers who make contracts three months from now, can expect to pay an advanced price. Southern furnrces, however, have something of an advantage in this respect, as they are permitted to fill orders at the present rate till January 1, 1895, provided the orders are booked before June 15, the date set for the advance by southern lines.

The only staple that shows no signs of a stiffening in price are foundry facings, and as soon as the various manufacturers get tired of wearing each other out, the example of coke and coal and iron products will likely be followed.

The Predictions of Cassandra.

ACCORDING to the ancient Grecian mythology, Cassandra, the daughter of Prian and Hercuba, was adored by Apollo who promised to bestow upon her the gift of prophecy if she would grant his prayers and become "Mrs. Apollo." Cassandra accepted the proposition, but no sooner had she obtained the gift than she laughed at the tempter. Apollo, however, avenged himself by ordaining that her predictions should be discredited, and hence no one believed her predictions, although too late they were found to be invariably correct.

In one respect (that of not being believed when predicting the future) the world sees daily many illustrations of the story of Cassandra.

Two months ago we heard a shrewd, far-seeing, well posted business man say that the uncertainty of this tariff legislation would so depress the business world that trade would, if anything, get worse instead of better until such times as it was settled, but the very day it was settled would see the inauguration of a feeling of business buoyancy that had not existed for years.

Manufacturing enterprises would feel encouraged to start up their plants and thousands of idle men and women would find employment, earn and spend wages and the life blood of the nation, its currency, would again speed through its accustomed channels with the vigor accumulated through a long period of inactivity.

Enterprisees that had been postponed for tangible or indefinite reasons would be pushed to completion and business men generally would shake off the lethargy that had overshadowed them for months.

Stocks of raw material of all descriptions have been so depleted that there is little or nothing on hand in the iron trade, this has been brought about by the closing down of furnaces, mills, etc., and in the coal and coke districts prolonged strikes have brought us to the verge of famine.

We may be optimistic, but if so, it is excusable at a time when there are so many pessimists abroad in the land, but a conservative review of the situation convinces us that in the words of Sir Walter Scott, "There's a gude time coming.

The Scrap Heap.

In order that the human body may be kept in a condition of perfect health it is desirable among other things that it have, not only an ample supply of nourishing food at all times, but that there should also be a sufficient variety to prevent the taste from palling.

* * *

THE FOUNDRY was just beginning to think that the mental pabulum the Foundrymen's Associations have recently been spreading before their members was apt to have some such an effect, as our physical and mental appetites are alike in needing at times a change, and too much of any one thing is apt to so pall on the taste as to create a revulsion against that particular diet for a long period.

* * *

We notice, however, a recent variation in the programme, which has been so warmly kept up since the publication of the first paper in THE FOUNDRY of November, 1893, which in some respects almost deserves to be called a diversion. Mr. West has introduced the subject of test bars and testing iron, prefacing the subject by a broad and at the same time perfectly correct statement to the effect that "there is no one element in iron founding at the present day showing more need of uniformity and simplicity in methods than the testing of cast iron."

The statement was made in a paper which will be read at the next meeting of the Western Foundrymen's Association, and we notice in the reports of the meeting of the Eastern Association, held May 2, that similar sentiments were expressed by some of those in attendance.

* * *

There can be no doubt but that much of the value of the work done hitherto by chemists, metallurgists, advanced foundrymen and seekers after knowledge along this line, has been lost owing to this very fact, and it seems to THE FOUNDRY that the time has come when some of the leading engineering or scientific societies of the world should take the matter up, discuss it in all its phases and definitely formulate reasons why in their opinion a test bar of a certain shape and size should be the standard one for cast iron work, because until a standard is decided upon, comparisons and explicit definite relative work is out of the question.

* * *

If a bar of uniform size and shape were adopted it would be possible to compare results, and as different classes of work require

different forms of test work and a different class of records to be kept it would be possible to know exactly what we are accomplishing along certain lines. For example, Mr. Keep, for stove work, endeavors to keep shrinkage at about .125 and no chill, while Mr. E. H. Mumford, superintendent of the the Worthington Steam Pump Company, at Elizabethport, N. J., recommends for heavy hydraulic work .155 shrinkage and .08 chill of Keep's test bar, and so on with a certain chill and shrinkage for each kind of work. This relative method, one size bar, one routine and a different record for each kind of work strikes us as being what is needed.

* * *

The idea heretofore seems to have been to get a test bar as near as possible like the work to be made for a special test. For a cylinder one inch thick, an inch bar; for one three inches thick, a three-inch bar. Mr. Mumford makes the point that if you go this far you should go still farther and have your bar made in green sand for a green sand mold, have it made in dry sand for a dry sand mold and in loam for a loam mold.

* * *

It may not be amiss here to give the principle sizes of bars in use:

½ inch square, 12 inches between supports (Keep's Bar).

1⅛ inches square at one end and tapering to ⅞ at the other, and 12 inches between supports (Brown & Sharp Test Bar).

1	in. sq.,	12	in. between	supports.	
1	"	24	" "	"	
1	"	48	" "	"	Architects.
1	"	54	" "	"	"
1	x2" sec.	12	" "	"	
1	x2" "	24	" "	"	Water Pipe.
2	x2" sq.,	21⅓	in. "	"	N. & W. R. R.

The tensile strength being generally regarded as four times the transverse strength. The test bars are made as nearly as possible to the size intended and a correction is made for the difference in area by the formula. Strength varies as the square of the height as the breadth and inversely as the length.

* * *

It strikes us that as none of these bars can represent the casting, not being its exact size that tests are all more or less relative. That being so, why not make them wholly relative and all use one bar?

* * *

That the matter is considered to be important is shown by the fact that the American Society of Mechanical Engineers long since appointed a committee to consider it, and as the committee is composed of such well-known gentlemen as Robert W. Hunt, Chicago; G. C. Henning, New York; C. H. Morgan, Worcester; R. H. Thurston, Cornell University; E. D. Estrada, Pittsburg; and W. J. Keep, Detroit, it is reasonable to suppose that when this committee do report, something in the way of a valuable contribution may be looked for as they are all of them familiar with the various processes and appliances in use for determining results, by both the chemical and physical sides of the question.

How to Make a Gear Wheel Four Inches Face, From a Pattern Three Inches Face, the Arms to Be in the Center.

THOUGH this may appear to a great many molders to be a simple job, yet there is a large number of others, some of them very good molders, too, who would find it a difficult undertaking, and I think perhaps they would lose it at the finish.

The pattern being 3 inch face will require 6 pieces of wood 1 inch wide, 2 inches long and ½ inch thich. Put down a straight followboard and put the pieces of wood together (thus forming one inch) on the board and put the pattern on top of the pieces. This will make the pattern 4-inch face from the board over all. Now put on the drag and ram up in the usual way, roll over, clean out around the arms and draw the pattern without swabbing it, taking care to mark it so that it can be returned to the mold in the same place.

When the pattern is out, take three of the pieces of wood and put one in each of three of the arms so as to raise the pattern a half inch; place the pattern back carefully, watch it in order to prevent shaving on sides of the teeth which would leave a bad mark on the mold, then tuck under the arms and hub with good sand, being careful not to ram in the rib; then ram the teeth nicely and firmly, work up a joint level with the edge of the flask parting down to the arms. Ram up cope, lift off and

finish, drawing the pattern again without swabbing, marking it as before. Then put in the other pieces of wood, one on top of the pieces already in, raising the pattern over half an inch, making one inch in all; put the pattern back, ram up the teeth nicely, make a joint as before, then swab it and draw the pattern and finish the mold. Besides, the cope should be tried off to see that there are no teeth crushed. It is all right, and the flask should be closed, care being taken not to clamp too tight. This of course is a little difficult job, but if the molders follow all the necessary directions it can be successfully done.

Strike.

THE coal strike of 1894 will go down to history as the most far-reaching and important strike among operators that this striking age has seen. Probably no similar demonstration on the part of workingmen has ever at any time commanded so large a measure of popular sympathy from all classes as this one, and the more the matter has been ventilated, the more universal has become the feeling that the miners ought to succeed in their attempt to establish a uniform rate of wages that would at once be fair to all parties and permit them to keep body and soul together.

Such a well known and well informed authority as Chauncey Depew and scores of others whose names are equally as familiar to the American reading public, have lent the influence of their names to the statement that this trouble has been brought about almost exclusively by the miners themselves, while Professor Edward W. Remis, of the University of Chicago, leads the list of statisticians and other authorities who have investigated and given to the world the authentic statement of the wages paid the miners and the justice of their cause.

He says: "The average wages of the 21,323 miners in Illinois were only $6.87 a week; of the 19,591 Ohio miners, $6.76; of the 53,780 bituminous miners of Pennsylvania, $7.55, and of the 70,669 anthracite men, $6.21. The report for 1892 of the Ohio Bureau of Labor Statistics confirms this, for it gives the average weekly earnings in 1892 in that State as $6.67. In most States wages average about $2 a day when the men have work, but this is usually not over 200 days in the year.

These rates had been reduced about one-third when the men threw down their tools. The contract entered into between coal operators and railroad managers, reducing the price of coal ranging from $2.25 to $2.50 last year when the wage rate printed above was in effect, to $1.90, involved a one-third reduction. The question now to be considered is: Who is responsible for the strike? Another question is: Who will profit by it? Will not the losses incident to the strike be a hundred times greater than the amount the operators hoped to save in wages?

While in a few instances there have been a few cases of violence, yet, all things considered (the number and character of the men involved), President McBride has succeeded with wonderful tact and shrewdness in holding his men together, keeping them united, preventing acts of violence and winning the respect of a very large portion of the American public.

The press of all shades of opinion has, with one or two exceptions, spoken of him in the most laudable manner, and much sympathy has been expressed with him and for his efforts in behalf of the half-fed and half-clothed members of his association.

That this popular indorsement has not been entirely unanimous it seems to us is a sort of national disgrace. One trade paper, somewhat noted for its slavish obsequiousness when the sacred rights of capital are at stake, makes the following statement:

"It is a question for serious consideration whether, at the call of one man, industries should be compelled to halt in the way that has been witnessed since John McBride commanded 160,000 miners to throw down their picks. It would not be long before the cry of conspiracy would be raised were there a combination among coal operators to shut down their mines, and turn their workmen adrift. Yet the paralysis of business, through the deliberate creation of a coal famine, is taken as a matter of course."

The above is the only thing of its kind we have noticed in a somewhat extensive course of reading upon this subject.

We do not doubt but that in the minds of fair and unprejudiced people all these facts will only help to strengthen the conviction of the justice of the miners' cause; and their defeat would be a weapon in the hands of the mine owners with which to cut each other's throats.

The *Review of Reviews*, which is usually regarded as being very fair and certainly not apt to favor the methods usually adopted by

workingmen to secure their rights, sees much that compels it to espouse the cause of the miners, and in its June issue presents a synopsis of the trouble that no impartial well-wisher of humanity should fail to indorse. The success of the miners means happiness to over a quarter of a million of the inhabitants of this continent, while the success of the operators would mean the utter demoralization of the miners' wages; cast thousands of them and their families upon the charity of the people of this country; bring starvation and death during the coming winter to many of their homes, and leave the mine owners not one bit better off than they would be if living prices were paid to those who contribute to the wealth and prosperity which most of them enjoy.

James Chalmers.

The Unvarnished History of a Common Man.

BY W. EDWARD.

CHAPTER VII.

(CONTINUED FROM APRIL NUMBER.)

TIME flies quickly when your mind is preoccupied by something outside of your work, and more especially is this the case when you are in love, at least such has been my experience. There was no doubt that I was deeply in love with this beautiful girl before I had known her a week and though no word of love had passed between us I felt that my tender feelings were reciprocated by her. When you look at me now it may cause you to smile to think of a tramp like me ever being swayed by such tender sentiments, but you must remember that no matter in what condition of life we may be placed, in our inner nature we are all alike. We are all endowed with the same instincts, the same passions; "love's young dream" is just as real, just as sweet to the lowliest man and most ignorant laborer as it is to the cultured pet of society, though they may take different ways of expressing it.

Originally the girls had intended to spend but two weeks in visiting Mrs. Nelson, but on one pretext and another they were induced to prolong their stay for a month. This was a happy time for me. I lost no opportunity for meeting and cultivating a closer acquaintance with Belle and, thanks to Mrs. Nelson who had taken a fancy to me, such opportunities were not rare.

There were parties and dances, an occasional ride over the country roads and the quiet walk after church on Sunday evenings, which I enjoyed most of all. In this way the month passed quickly away and the time came all too soon for Belle to return to her home in Lexington.

The place seemed duller and more lonely than ever after her departure and the only comfort I had was in being able to correspond with her, but even this was small comfort, as I could not expect to hear from her oftener than once a week. The restless desire for change and excitement, however, was subdued for a time and I began to think that after all there were other things which were much better than rambling over the country. I even began to think of buying some property with the intention of settling down to make my home there, but when I thought of the opportunities for work, should anything happen to Mr. Nelson, or if anything should occur to mar our present relations I concluded that Belmont was hardly the place for a man to settle in who had to depend on molding for a living. Still, this thought of having a home of my own in some place where I could be sure of steady work, took strong hold of me and exercised an influence on me for some time. I had never drank very much and was not extravagant in my habits, still, having no incentive to save money, I placed but little value on it and it always managed to slip through my fingers so that at the end of every month I was as bare as when I commenced. Now, however, I began to economize as much as possible without actually stinting myself and to lay away my money.

Nearly seven months passed away without any event to break the monotony of life in a small town, except a visit I had paid to Lexington to see Belle, at which time I was introduced to her parents and was received on the footing of an accepted lover, although no formal engagement had been made between us. It was nearly a year since I came to Belmont, and by close economy I had managed to repay my aunt the money loaned me and had saved about $300. As I said before, Mr. Nelson was interested in a number of enterprises besides the foundry and machine shop in Belmont. He was also something of a speculator and had managed in some way to involve himself financially. Of course, an event of that kind can hardly be kept quiet in a small place, and in a few days it was openly talked of in the shop,

so that we were not surprised when one morning the sheriff took possession and closed the doors. Although I was heartily sorry for Mr. Nelson, as both he and his wife had been very kind to me, I was not sorry on my own account as it gave me an excuse for getting away and finding a place in which I might settle down.

I went to see Mr. Nelson and told him I intended to leave, but would come back again if he wanted me when the trouble was settled. I had not thought where I should go, but made up my mind it would not be to Cincinnati, as I had seen all of that city I cared to for some time. Strange how a man takes a dislike to a place if he happens to have a little bad luck in it. I have been to Cincinnati several times since then and think now that it is just about as nice a city as there is in the country for a poor man. The next large city was Louisville and as it was near Lexington I concluded to go there. After a few days spent in preparations and leave-taking I started for Louisville, and as was natural, stopped over in Lexington to pay Belle a visit. I thought the time had come for me to know definitely whether there was any hope for me, so that I might make my arrangements accordingly, and I took this opportunity to ask the all-important question which was answered in a manner highly satisfactory to me. I had only intended to stay there for a few days, but it was so hard to tear myself away that a week had passed before I could make up my mind to leave. We had agreed that I should go to the nearest city in which I could get steady work and as soon as I could make a home for her I would come and claim my bride.

It was with a light heart that I stepped on the train that was to carry me to Louisville, though I was not sure of getting anything to do. Yet, who would not be light hearted with such prospects before him? Arriving in Louisville I immediately began to look for work. The first shop I went into was an agricultural shop, and I was a little amused at the answer I received from the "boss" when I asked him for work. He sized me up for a minute and then said, "Are you a molder?" I replied that I was. "Well," said he, "you don't want a job in this shop; we haven't any molders here." "Why," said I, "you have at least thirty or forty men on the floor; what do you call them if they are not molders?" "Oh," said he, "they are only scrubs which we pick up off the gangway. I have only three molders in the shop, and they are fools enough to work here for $2.25 a day and teach these scrubs to take their jobs." I next went to the L. & N. shops and succeeded in getting a job there. I considered myself fortunate in getting work so quick, but the secret of it was that I was well dressed and didn't have such a seedy look about me as I wear now, and as molders in search of work generally carry. I had got work, but it was not the kind of work that I wished, as I have never had any particular love for pounding my brains out to make a living, and the floor I had was nothing but pounding sand all day long. The day's work was not very large, but neither were the wages, and I could not see anything to be gained by settling down in a place like that. There were several good machinery shops in Louisville, but I found that a new man would almost have to buy a job in any of them and the wages were not much better than they were in the railroad shops. I had been there about two months when I heard of the new car shops of the Ensign Car Company, in Huntington, W. Va. Several of the Louisville men had gone there to work and they all sent back good reports of the shop and the big wages they were making. This looked like an opening for me; it was a new town and promised to be a city some time, as it was the terminus of the Chesapeake & Ohio Railroad. Accordingly I went to Huntington and was fortunate enough to get a job. The foreman at that time was one of the nicest little men I have ever had the fortune to meet. He was a gentleman in every respect and treated his men as such. When I asked him for work I told him that I did not care for the rough car work and would rather make less money on a better class of work At that time he had nothing but a car-work floor to give me, but promised as soon as he could that he would give me something better, so with this agreement I went to work for him. This was the first time I had ever worked in a piece work shop, and I was astonished at the greed of the men. I have never seen the human hog so fully developed as it was in that shop. Some of the molders were drawing as high as $130 and $140 a month and paying a helper $1 a day out of that, but how they did have to "root" to do it! Talk about machines; why, the average machine wouldn't be in it with some of those men. They were in the shop as early as 4 o'clock in the morning and some of them would even come back after supper to take out their castings and cut up the sand. There were two oil box floors and a molder

and helper put up forty-two oil boxes a day. They afterward put in machines to do this work, but the boss told me confidentially that it cost about double on the machine what it did on the floor. Of course, all of the men didn't work like that, and if the foreman could have had his way he would have abolished it pretty quick, but even the best of them were not proof against the temptation to "pull out," when they saw others with such fat envelopes on pay day, and I don't think there was a man in the shop who averaged much less than $3 a day. I never went to work before 7 o'clock and was always out of the shop before 6, yet I managed to make from $90 to $100 a month all the time I was there.

I worked along on the car work for several months before I got a chance for a job on the machinery work. I did not expect to make as much on this class of work as I had on the rough work, but the prices on engine work were good and I found that I could make as much money and work a great deal easier. I have seen plenty of good shops spoiled by the hoggish instincts of men and this was one of them. I was not there very long before they began to cut prices on the work, and the men, instead of taking warning at this, only worked the harder to make up their wages. That is the curse of piece work, and every place I have seen it the story is about the same. The shop starts with fair prices and the foreman hires a few "rushers," giving them the pick of the work and paying them good prices. They start in to make $6, $7 and $8 a day and all the rest try to keep up with them. Then the cuts in prices begin and almost before you know it the shop is ruined and a man can hardly make living wages. When I went there first it was my intention to buy some property and make my home there, but I soon saw that at the rate things were running, in a few years the shop would not be fit to work in, so I determined to get the cream while it was going and leave before it got to be unbearable.

(TO BE CONTINUED.)

The Connersville (Ind.) Blower Co. are increasing the capacity of their plant by the addition of a building and new machinery.

D. R. Wing & Co., of Little Rock, Ark., operating a foundry and machine shop, have failed. C. E. Rosenbaum was appointed receiver.

J. W. Veness, of Albert Lea, Miss., has just put in his plant a 3-ton cupola, 2-ton crane, a small brass furnace and other machinery.

The Fire Fiend.

Lessig Foundry, recently burned at Williamsburg, Pa., will be rebuilt.

Marsch Bros.' foundry, at Stroudsburg, Pa., burned a short time ago; will rebuild at once.

Fischer-Leaf Co.'s foundry at Louisville, Ky., was destroyed May 18. Loss, $10,000; fully insured.

A recent fire at the Worthington Company's foundries, Elizabeth, N. J., caused a loss of from $10,000 to $12,000.

The Jelly Foundry Co.'s plant, at Millvale, Pa., has been burned to the ground. Loss, $30,000; insurance, $4,500.

Spence, Boggs & Co.'s stove works and foundry at Martin's Ferry, O., was damaged to the extent of $1,000 by fire, May 10.

Pierre & Gamache's foundry, shop and mill, with all their contents, at Bic, Que., burned May 24. Loss, $30,000; no insurance.

The foundry and machine shops of Thomas Sharp & Co., at Salem, O., were completely destroyed by fire recently, causing a loss of $30,000.

The Lima Steel Casting Works, at Lima, O., was burned to the ground May 8. Loss, $300,000; insurance $100,000. The plant was comparatively new and was one of the best equipped in Ohio.

New Foundry Enterprises.

Smalley Bros. will erect a new foundry at Saginaw, Mich.

The South Malleable Iron Co. has been incorporated with a capital of $100,000 to build a foundry in South Milwaukee, Wis.

The Mt. Pleasant (Mich.) Foundry and Plow Co. has been formed with a capital stock of $11,000 by James G. Clarke and David N. Mauer.

The H. P. Deuscher Co., of Hamilton, O., who purchased the equipments of the Excelsior Foundry Co., are moving them to their plant in that city.

The North Carolina Car Co. have begun work on their new foundry at Raleigh, which is 82x172 feet, with cupola. The furnace and car building shop is 86x120 feet.

Robert McHatton has established a foundry in Philadelphia, where a specialty of brass and bronze castings for electrical, hydraulic and other kinds of work, will be made.

The Cleveland (O.) Smelting Co. have been incorporated to manufacture all kinds of brass, bronze and aluminum castings. Albert Straus, J. E. Ingersoll and others are interested.

The Buckeye Machine Works, of Anderson, Ind., are erecting a plant which consists of a foundry warehouse, sheds, etc. The main building will be 50x300 feet, with three wings, each 50x100 feet.

The American Steel Foundry Co., of Granite City, Ill., have begun work on their new plant which is expected to be completed by August 1. The foundry will be 400x175 feet, while the other buildings will be of smaller size.

Among the Foundries.

George Lombard, of Augusta, Ga., bought a large plant in Savannah, in that State.

The National Transit shops, at Oil City, Pa., have made a frame for a pumping engine, weighing 25,000 pounds.

The West Point Foundry, at West Point, Miss., have enough work on hand to keep them busy till January 1, 1895.

The Kalamazoo (Mich.) Foundry and Machine Co. are building an addition to their foundry, which will be 52x75 feet in size.

A serious explosion occurred in the cupola of the Buffalo School Furniture Co., at Buffalo, N. Y., May 17. Five molders were seriously hurt.

The Worthington Pump Co. have removed their brass foundry from South Brooklyn, N. Y., to Elizabeth, N. J., where the iron foundry is located.

The Marion (Ind.) Iron Gray Foundry Co. have been running steadily through the depression. Light gray and heavy castings are produced.

The Commonsense Engine Co. have contracted to make all the castings for the Whitely Mower and Reaper Works, both of Muncie, Ind., while a new plant is being erected.

Obituary.

Abraham Garrison, the millionaire foundryman at Pittsburg, Pa., died, May 10, in that city. Mr. Garrison was born March 4, 1804, in Orange County on the banks of the Hudson, south of Newburg. The station at West Point called Garrisons was named after the family. His father owned property on the Hudson near West Point, and was owner and captain of a sloop which sailed between New York and Albany. From the age of 14 Mr. Garrison assisted his father in the navigation of his sloop, of which, before his 21st birthday, he was captain. Among the reminiscences of the past that he loved to recall was the fact that he saw Fulton's steamboat when on its first trip up the Hudson River. On reaching his majority he left the boat and went into the grocery business in new York. He went to Pittsburg in 1826. But a few months ago he talked entertainingly of a trip to Washington, in which he said: "In 1846, when I was at the Capital, I saw Clay, Calhoun, Webster and Benton, in the Senate. A party of us each paid Samuel B. Morse 50 cents to telegraph our names to Baltimore, and he was glad to get the money."

David Moore, proprietor of the Oregon Brass Foundry, died at Portland, Ore., April 20.

Michael Mallon, of Ogdensburg, N. Y., died at his home very suddenly, recently, aged 72 years. He was born in Ireland, and came to this country sixty-two years ago. In early life he settled in Ogdensburg and was engaged as a molder in the employ of Alden Bros. for several years.

James Harvey Hitchcock died at Troy, N. Y., May 11, while visiting his sons in that city. He was born in Troy, September 9, 1816, and for some years was connected with the Meneely Bell Foundry, and afterward with the old firm of Jones & Hitchcock, also bell founders. Subsequently he was in business in New York City for some years, removing to Chicago in 1870, where he has resided ever since.

Pittsburg and Vicinity.

The Trade Outlook.

(*Special to* THE FOUNDRY.)

THE great national coal strike is gradually shutting down mills in all directions. In the Pittsburg district, nearly all the furnaces are banked, rolling mills are being shut down, while a number of foundries are closing down for lack of fuel.

One effect the coal strike has made, is the advance in price of raw material, but it is thought that when the strike is settled, prices will lower somewhat, but not reach the figures they were quoted three or four months ago. All the sup-

plies now on hand are being used to full extent and founders are economizing greatly. There are very few signs of a genuine improvement in the iron and steel trade, some reports show activity in a small way or in other words, to cover present requirements. The production of steel and iron castings is greatly restricted and some founders are of the opinion that it will be to their advantage in the long run. Material is running short in all lines, and it is hard to say what market complications may yet be caused by the coal strike.

It is thought that during the month of June, prices will advance for all grade of foundry iron, but so far the quotations given in our last issue still rule. Prices are:

No. 1 Foundry,	$11.25@11.50 cash.
2 "	10.00@10.75
1 Charcoal f'dry,	17.00@17.50
2 " "	16.00@16.50

The Leechburg Foundry & Machine Co., has just shipped the machinery for the plant of the Minneapolis (Minn.) Rolling Milt Co., consisting of one 51-inch squeezer, one 18-inch bar mill, one 18-inch muck train, and one roll lathe. The company reports that it has just fitted up several tin plate mills with machinery, and which are now in successful operation.

The Reliance Steel Casting Co., Ltd., reports business as gradually improving, having received a number of fair-sized orders during the past few weeks.

The Robinson-Rea Manufacturing Co., of the south side, is working on a contract which calls for a lot of machinery for the new plant of the Saltsburg (Pa.) Rolling Mill Co.

The Fischer Foundry & Machine Co., of the south side, is getting out a new line of automatic engines for electrical and general purposes, which will be put on the market shortly.

The Totten & Hogg Iron and Steel Foundry Co., has closed a contract with the Irondale Steel & Iron Co., for its new tin plate plant at Middleton, Ind. The contract calls for three 24-inch hot mills, all complete with rolls, etc.; one squaring machine, two double shears, and a lot of spare rolls. The company's plant is being operated in full and has orders on hand which will keep it going for some time.

The McKeesport Foundry & Machine Co., is doing only jobbing work these days, as very few mills are in operation and no orders are being placed. All the large orders are now cleared up, but business is expected to improve soon.

The stockholders of the Kepp Gear Wheel & Foundry Co., of Allegheny, will hold a special meeting on the 21st inst., for the purpose of voting for or against an increase of the company's indebtedness.

The Lincoln Foundry & Machine Co., of this city, has let the contract for two 150 horse power boilers to R. Monroe & Son, while the Nordberg Manufacturing Co., of Milwaukee, Wis., will furnish the engine.

Thomas Carlin's Sons, of Allegheny, are busily engaged in making shipments of phosphate machinery to Florida, and also is making hoisting engines, derrick's, etc., to be used for the construction of the new Herr's Island dam.

Our Chicago Letter.

(*Special to* THE FOUNDRY.)

THE Situation in Chicago remains about the same as it has for the past five or six months. The various strikes throughout the country have given to the observant, food for thought, and all, who have studied the problem can reach but one conclusion: that low wages benefit no one. It would be better for all business and the people in general if the workingmen were earning $5 per day, for the working people are the consuming power and upon their success hinges the prosperity of the country. Just so sure as the factories create the supply according to his wages, does the workingman create the demand. In earning $5 per day, his purchasing power is larger, and he buys more from the retailer; the retailer, more from the wholesaler; the wholesaler buys more from the factory, and in turn the factory increases its capacity, puts more men to work, and thus the idle labor is employed. At $5 per day the workingman

would be able to save a little and in time build his own home, which would cause to be employed the carpenter and the mason, whose employment would keep the saw-mills a-going and the brick kilns in blast. Thus it can be traced all along the line, for indirectly the wage question has its effect on all. It is, so to speak, the foundation upon which is built poor or prosperous times. The argument is raised that wages cannot be advanced, because they won't be able to get any more for their product, and if they were inclined and desirous of advancing the wages, competition would prevent it. It is a mistaken idea to think that low wages aids in competition, for as soon as the wages are reduced, the market demands that the article of trade shall have a like reduction. Therefore, reduced wages adds nothing to the profit of the manufacturer, and certainly does not benefit the workingman. The idea of starving men into submission to settle disputes, is a false one, for when men after a winter of privation, like the last, without a dollar in their pockets, nothing in the house to eat, and barely enough clothing to cover their backs, will lay down their tools and strike, it is proof that it makes no difference what circumstances they are in, or how poverty stricken they may be, they will fight for what they consider their due. Daily proof of the above should suggest that the time has come when other methods than the present of settling labor troubles be adopted.

Cribben & Sexton have built in connection with their works on Erie street, a five-story pressed brick building, 50x 100 feet. They will discontinue their store on Lake street and all office work will now be done at the works.

A. Bolter & Son, Belden avenue and Ward street, are busy.

Board & Cumming have started their new foundry on Bongeld street. They have plenty of orders and expect a prosperous trade.

Vierling, McDowell & Co., Twenty-third street and Stewart avenue, are quite busy and expect to be for some time.

Dawson Bros., 199-205 North Halsted street, say business is improving some.

King & Andrews have incorporated to manufacture semi-steel. They now manufacture crucible steel, semi-steel, and gray iron castings. H. S. V.

The Foundrymen's Association.

THE regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club, in Philadelphia, on Wednesday the 6th inst., the vice-president, Thos. Devlin, occupying the chair. There was a good attendance of members.

The Executive Committee reported that after a general investigation they found the foundry trade in the depressed condition, in fact no better than it had been during the past seven or eight months. The average was about as follows, which represented the working of 100 foundries:

10 running full time, or six heats per week.
25 running five heats per week.
25 running four heats per week.
35 running three heats per week.
5 stopped altogether.

In addition to this state of things, the committee had found prices for castings very much reduced. It was true pig iron had fallen in price $4 to $6 per ton, but castings had fallen in the mean time more than double that amount. They were of the opinion that reductions did not fall entirely to the foundry trade, as almost all other trades were affected in about the same proportion. They could see no decided change for the near future and it appeared to them that this year's business would be unprofitable.

They had learned, however, of a great many economies which were being practiced in all directions. Molding machines were being placed in a number of shops where duplicate work was required, and now and then cases of wages being reduced were heard of. Every one seemed to be waiting for better times, and when they came—it must be sooner or later—they would be most welcome. This was also the case with the makers of steel castings, who had felt the depression to even a greater extent than iron foundries. They found

that stock had been very much reduced and people were buying only from hand to mouth to fill immediate wants. There was a great scarcity of bituminous coal, caused by the strikes all over the country; some concerns had stopped entirely for the want of it. While this was a loss to the miners, railroads and manufacturers at present, it might prove to be a blessing in disguise later on and encourage the users of all classes of goods to lay in larger stocks to provide for emergencies of this kind.

C. R. Baird & Co., of Philadelphia, and the Phœnix Iron Works Co., of Cleveland, Ohio, were elected to membership in the association.

The treasurer reported a balance on had of $194.58 and all bills paid.

The Price Committee then reported by sections.

Cast Iron Water Pipe.—In reporting for this section, P. D. Wanner, of the Reading Iron & Foundry Company, of Reading, Pa., said that he had little to report that was favorable to the trade except that the consumption of cast iron pipe was very good indeed in spite of the depression, and if people would study their interests he believed the trade would be still larger. He could not see how anybody in years to come could expect to buy pipe for less money than it could be bought for at this time. As he had had occasion to say before, while the cast iron pipe business was very large the demand was readily and easily supplied. When it was remembered that there were 40 or more pipe founders in business today where there were but 10 or 15, ten years ago, the oversupply was easily accounted for. Not only in this but in other industries the oversupply was apparent. Furnacemen and others in kindred trades when pressed increased their capacities in the belief that the duller the trade the larger the output should be. People deceived themselves with the idea that by increasing their output they were decreasing their cost.

The pipe foundry trade, he said, was overdone. The good times and high prices encouraged it, and the South came in with large foundries, cheap iron, fuel and labor, and Northern and Northwestern concerns were crowded to the wall. As long as that was kept up there was no future in the cast iron pipe trade and none to be hoped for in years to come. He had always believed the business could have been controlled so that foundrymen would be confined to their own district, but for one reason or another nothing could be accomplished and the competition had been going on. There were always people, he said, who thought that in the fight for the survival of the fittest they were the fittest and could outstrip all others in the race, but who were themselves the first to go under. There were many who thought that way and were not willing to enter any arrangement which would enable them to get a fair profit, but he believed such an arrangement would come eventually. It had been established in the old country and would be here. In the next few years, he thought, owing to the great cheapness of pipe, the trade might be largely stimulated and sufficient work result to go around to all the foundries, but not sufficient to raise the price. Pipe had lately been sold at as low as $14.75 per ton. It was second-hand pipe, but it was in competition with new pipe. Outside of that, pipe had been sold at $17 to $17.70. He thought some of the members present might feel glad they were not in the pipe foundry business. He used to value the general foundry business at very little, but last year and this year it was the only redeeming feature of his business.

Cast Iron Soil Pipe Section.—R. A. Register, of Register & Sons, Baltimore, for this section reported that since last reporting quite a number of foundries were running full and prices were firm.

Sash Weights.—For this section, E. E. Brown, of E. E. Brown & Co., Philadelphia, reported that the volume of business in this section was smaller and prices were extremely low. Each day lower prices were heard of.

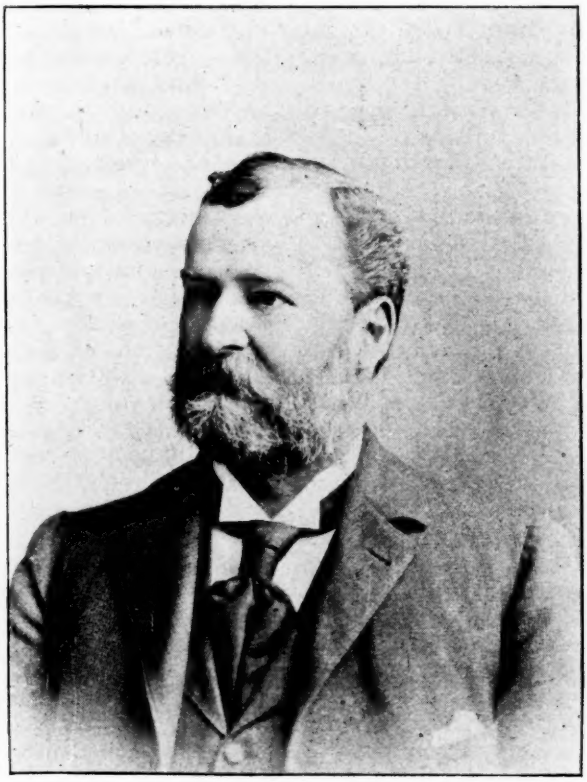
Mr. Stirling read a paper by Wm. Molin, E. M., of New York, on the subject of "Foundry Chemistry," and Mr. Flagg read a paper by Prof. J. B. Johnson, of Washington University, St. Louis, Mo., on the strength and resilience of structural cast iron.

Geo. D. Dana.

THE majority of our readers and especially stove foundrymen, will not need to be told that the accompanying portrait is a faithful likeness of the president of the National Association of Stove Manufacturers, Mr. George D. Dana, of St. Louis, Mo.

The fact that he has served in that capacity for several terms, being chosen for the head of an association containing so many brilliant and capable men speaks most emphatically of his abilities in more than one direction, and no compliment that we could pay him would be as significant as that already so deservedly conferred upon him on many occasions by his fellow stove manufacturers.

Mr. Dana, however, has one remarkable characteristic that perhaps his associates have never noticed, and that is his excessive modesty, as, notwithstanding the seductive letters written to him with a view of securing a brief sketch of his life for publication where it would be seen by so many of his friends and admirers, we have as yet not been able to secure much else than the knowledge already possessed in common by all who have known or heard of the gentleman, viz,: that he came on earth like the rest of us; is, we are glad to say, with us yet, and likely to remain for some time. If he lives half as long as his friends would wish, he would certainly see the next Centennial.



GEO. D. DANA.

Cincinnati is responsible for being Mr. Dana's birth place in 1845. In 1858, when but 13, he removed to St. Louis, entered the employ of Mr. Giles F. Filley in 1862, and has been connected in business with the latter gentleman

ever since, being elected secretary of the Excelsior Manufacturing Co. in 1880, a position he holds yet, Mr. Filley being president of the company and the well-known Charter Oak stoves their principal output.

Another Emergency Job.

THE "old man" came into the foundry one day with one of those jobs which it is the foreman molders fortune or misfortune to meet with often, namely, a job that was wanted immediately and no pattern to make it from.

Thinking it may be interesting as showing what can be done in an emergency, I send you the following description of how a very satisfactory casting was got without much in the way of patterns, and at a very slightly greater cost in molding than if these had been complete.

The casting wanted was a box girder of peculiar form. It is shown in Fig. 1.

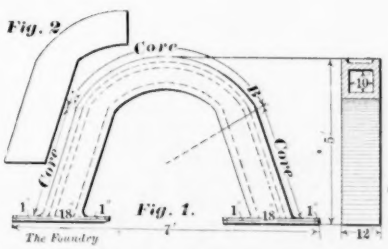
After turning the thing over in my mind a little, I got from the pattern-maker the following pieces: First, an outline templet of the casting shown in Fig. 2; second, two boards (Fig. 3) as wide as the casting was deep, and of sufficient length to form a core to reach from A to B (Fig. 1), having attached to them with screws the pieces C. D. cut to radius of outside of girder; third, the sweep E (Fig. 3).

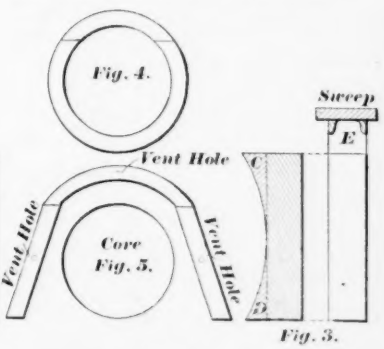
I then started the coremaker on the cores, using for the circular part two pulley rims (Fig. 4), and for the straight part two boards shown in Fig. 3, first removing the circular pieces C and D. The outside of the casting was to be made in dry sand and the core for this was swept up by means of the sweep E, and the boards shown in Fig. 3.

In the meantime a molder had set up a spindle in the floor, and swept up a surface large enough to take in the whole mold.

The templet was then laid down and the size of the casting marked out in order to place the gates and risers in proper position. He then rammed up the cope, lifted off, and then dug out deep enough for the casting. The spindle was then put in again and the bottom surface swept out.

The inside circle of casting was next rammed up, using for that purpose the smaller of the two pulley rims that had previously been used for making the core. For ramming up the inside straight part I used the boards that had formed the sides of the straight corebox, using the templet to set them by.





The dry sand cores forming the outside of mold were next set and backed up with sand, then the main core on chaplets, the vent taken out, the cope put on, and the mold was ready.

CHAS. STROTS.

MR. EDITOR:

Please be kind enough to tell me through your columns how to proceed to cut steel plate; to cast iron for such purposes as anneal blocks, etc. Is any special steel needed? If so, what is it? If there is any special arrangement of mold necessary, I would like to know it.

Yours, etc.,

GEO. C. MEADOWCRAFT.

Foundry Use of Physical and Chemical Tests.

*BY W. J. KEEP.

I BEGAN this discussion by saying that the only way to arrive at correct conclusions regarding cast iron, was by means of properly conducted physical tests explained by chemical analysis; also, that the physical structure of cast iron is wholly dependent on its chemical constitution; also, that a determination of shrinkage and chill would indicate when the correct percentage of silicon was present, and that the strength and deflection would tell if the mixture had been arranged to the best advantage.

Some have objected to my methods, rather than defend their own side of the case by facts and figures.

Opposition to New Methods.—There are those who always oppose a new manner of arriving at conclusions. Not one of those who have raised objections, has ever used or seen my apparatus, or has seen one of my half inch test bars. A letter lately received, speaks as follows: "The difficulty with the chemists, and with all who have not had practical experience with your admirable system, is that they are disqualified for an intelligent understanding of the question at all." It is easier to object and imagine difficulties, than it is to present original research.

My effort has been to find reasons for the behavior of cast iron, and to present them in such a manner that the founder who has not had the advantage of a chemical education, can intelligently purchase and use iron.

The one-half inch Square Test Bar.—The explanation of the influence of the five metaloids in cast iron, which has been made during the last six years, by a study of the half-inch bar, is all the defence that it needs. I gave a summary of these conclusions in my paper of April 4.

It has been stated that "test bars to be trustworthy; must be of a size to give approximately constant results." The truth is, test bars to be trustworthy, must be of a size to show correctly the quality of the iron, and cast iron always varies.

I only recommend the half-inch test bar for iron that will run gray or nearly so in this size, and this covers nine-tenths of foundry practice. The large amount of surface exposed to the mold, makes a uniform grain throughout, and causes it to indicate the slighest change in composition.

General Application of the half-inch Test Bar.—The behavior of this bar is the measure of the effect of silicon in a casting, whether large or small, just as a foot rule can measure a large or small object.

In *The Iron Age*, May 17, p. 946, Mr. E. H. Mumford, (with Henry Worthington), says: "It may be taken for a fact, that no one size of test bar is better adapted to a certain class of work than another. The great truth in this matter of test bars is, that whatever their shape, size of method of molding, they should always be make and tested in exactly the same way. Follow up Mr. Keep's system, and you will get results like what follows:

"If a water cylinder three inches thick and weighing eight tons, gives a bar in "Keep's Test" that runs 450 in strength, .155 of an inch in shrinkage and .08 of an inch chill, you may be sure that the casting is free from shrinkage strains, will cut easily and is strong. If the same casting gives you a Keep bar that runs 350 in strength, .170 of an inch shrinkage, and .25 of an inch chill, you may be sure that you have a casting that, while it looks close and strong, will take twice as long to machine, has put its thinner portions under immense initial stress, and is very likely, therefore, to show shrinkage cracks, as the iron has not the strength necessary to resist either these or its working bursting pressure in service afterward, certainly not both at once. All this the little half-inch bar tells you of the big casting, and it does it better than the larger bar would."

I am allowed to take the following from the books of one of our largest

*A paper read before the Foundrymen's Association, at Philadelphia, June 6, 1894, which is a continuation of the paper read at the same place April 18, and which was sent out as a supplement to THE FOUNDRY, May 10.

machine foundries. "By analysis, silicon 2.26, average chill of a Keep's bar .075, shrinkage .154, strength 436. Iron open and soft, perhaps our best iron for general work."

3.00 or 3.25 per cent. silicon, and shrinkage .125 will make good stove plate, but a large machine casting must contain less silicon, which will be indicated by higher shrinkage.

Influence of Iron Standing in a Ladle.—I introduced in my last paper nine series of tests to indicate what could be shown by physical tests, and that chemical analysis could not do as much. I did not intend to turn the discussion in another direction. The 3.25 per cent. silicon iron, drawn from a cupola as fast as melted, produced stronger castings from the portion of iron which had been longest in the ladle. To get an explanation of the different experience of some who had observed an opposite effect, the experiment was tried at a prominent machine foundry in this city. The iron was for a three-ton cylinder and was very dull. This is shown in Series X (continuing the numbers of my last paper).

I also made a mixture of pig irons and scrap the same as in Series VII to IX, and melted it in a crucible. This is shown in numbers 803 to 805 of Series XI. I also melted one brand of pig iron in a crucible as shown in numbers 833 to 836.

Both these and the tests in my paper of April 4, show how iron behaved in each case, and taken together show that under different conditions different results may be obtained.

The Influence of Wet and Dry Molds.—As this question has been raised, "Keep's Test" can give the desired information. I have purposely gone to extremes. In 814 the mold was so wet that one of the five bars was perfectly hollow from a blow-hole. In the other wet molds the sand was as wet as possible to get sound castings. The dry molds were thoroughly dried. The regular mold was "tempered as for ordinary work, only rather dry" (Pamphlet "Keep's Test for Cast Iron," p. 7).

The Influence of Temperature of Cupola.—In the investigation of another subject the tests in series XIII. were made. Tests 812, 813, 824 and 825 were from the first iron that came down, which it contained. 812 and 814 were caught in a freshly dried ladle and then changed to another fresh ladle, the iron

SERIES X.

No Test.	28 Lbs. Iron in One Ladle. (Rested.)	Dead Load.		Shrinkage.		Chill.
		Stren'th	Deflec'n	Square.	Flat.	
806	Poured at once.	.420	.21	.160	.166	.150
807	Poured ¾ minute later.	.474	.24	.162	....	.150
808	Poured ¾ minute later.	.438	.22	.160	....	.150

SERIES XI.

No Test.	28 Lbs. Iron in One Crucible. (Rested.)	Dead Load.		Shrinkage.		Chill.
		Stren'th	Deflec'n	Square.	Flat.	
	Mixture Like Series VII to IX.					
803	Poured at once.	.359	.21	.125	.143	.08
804	Poured 1¼ minutes later.	.382	.21	.123	.145	.12
805	Poured 1¼ minutes later.	.378	.21	.122	....	.06
	One Brand Pig Iron Alone.					
833	Poured at once.	.402	.26	.158	.159	.17
834	Poured 1¼ minutes later.	.388	.23	.158	.159	.17
835	Poured 1¼ minutes later.	.376	.20	.158	.159	.17
836	Poured 1¼ minutes later.	.368	.17	.157	.158	.17

boiling in both. 813 was caught in a red hot ladle, next after 812, and shows only the influence of the boiling on the cupola bottom. 825 was caught in the hot ladle after pouring 824 but 300 pounds of iron had been taken out between the catches, and the iron had improved. 815 and 826 were from the middle of the heat, and show average

Relative Tests for Cast Iron.—The direct method, is to make a test bar as nearly as possible the size of the casting to be made. For example, if a casting is to be one inch thick, the test bar would be one inch square, if the casting is to be three inches thick the test bar would be three inches square. Such tests at different shops are not comparable.

SERIES XII.

No Test.	All Three Poured From One Ladle.	Dead Load.		Shrinkage.		Chill.
		Stren'th	Deflec'n	Square	Flat.	
814	Very wet mold.	420	.22	.146	.149	.04
815	Regular mold.	430	.23	.136	.142	.04
816	Dry mold.	414	.23	.130	.142	.06
818	Wet mold.	425	.22	.131	.145	.08
819	Regular mold.	468	.25	.132	.143	.08
820	Dry mold.	437	.23	.123	.138	.08
821	Wet mold.	398	.22	.128	.145	.06
822	Regular mold.	392	.22	.130	.146	.06
823	Dry mold.	407	.23	.120	.140	.05
827	Wet mold.	417	.23	.138	.147	.04
828	Regular mold.	417	.24	.129	.144	.05
829	Dry mold.	421	.24	.122	.140	.04
830	Wet mold.	375	.21	.142	.150	.05
831	Regular mold	387	.22	.140	.148	.04
832	Dry mold.	390	.22	.129	.141	.04

SERIES XIII.

No Test.	Separate Ladle for Each Test.	Dead Load.		Shrinkage.		Chill.
		Stren'th	Deflec'n	Square.	Flat.	
812	1st iron (after 200 lbs.)	.392	.21	.163	.187	.225
813	1st iron, next ladle.	.390	.20	.164	.175	.150
815	Middle of heat.	.430	.23	.136	.142	.040
817	Last of heat.	.397	.21	.132	.148	.075
824	1st iron (after 300 lbs.)	.375	.19	.162	.186	.225
825	1st iron (after 600 lbs.)	.415	.21	.163	.167	.100
826	Middle of heat.	.425	.23	.162	.141	.025

iron. Each of the tests in this paper were on different days, and are each averages of from three to five test bars. (Series IV. in my last paper is the test of the single bar of the set which was analyzed, while series VII. to IX. show the averages of the three test bars of each set. This explains the difference in the figures.)

The relative method is to make one size test bar for all sizes of castings, and to judge of the suitability of the iron for a given size of casting, by the shrinkage of this standard test bar. The experience of one foundry is a sure guide for another.

The composition of cast iron is so imperfectly understood, that few realize

that there is a direct relation between the shrinkage of a half-inch test bar and that of a casting. I will illustrate the truth of this relationship by table XIV, the figures of which are mostly taken from actual tests, but any change in the iron composition or other conditions would vary the figures somewhat. To produce a uniform grain and sound casting, and one-eighth of an inch shrinkage to the foot, the silicon must vary with each variation in the size of the casting.

But such a variation in silicon will cause a variation in the shrinkage of a half-inch test bar.

lustration of the value of this relative test.

The mixture 837 was perfectly satisfactory, but owing to a stoppage in shipments of pig iron, a new mixture, 838, was made. The shrinkage shows the need of more silicon, and this could have been corrected at once, but as it was necessary next day to change to a coke which was claimed to be purer, the iron mixture was not changed for 839. Next day the silicon of the mixture was increased in 840, and a continuance of another day (841) brought the iron back to the standard. 842 shows that silicon

TABLE XIV.

AN APPROXIMATE KEY FOR REGULATING FOUNDRY MIXTURES.

SIZE OF THE CASTING.	SILICON REQUIRED IN THE CASTING.	SHRINKAGE OF THE CASTING.	SHRINKAGE OF A ½ INCH TEST BAR.	SIZE OF TEST BAR "KEEP'S TEST."
½ inch sq.	3.25 per ct.	.125 per ft.	.125 per ft.	½ inch sq.
1 "	2.75 "	.125 "	.135 "	½ "
2 "	2.25 "	.125 "	.145 "	½ "
3 "	1.75 "	.125 "	.155 "	½ "
4 "	1.25 "	.125 "	.165 "	½ "

SERIES XV.

NO. TEST.	An entire change of iron mixture and coke in four days, good castings every day, 834 castings a little hard.	DEAD LOAD.		SHRINKAGE.		CHILL.
		Stren'th	Def.	½ in. sq	Flat.	
837	Old iron mix. with Conn. Coke	417	.24	.129	.144	.04
838	New " " " " "	407	.22	.148	.153	.07
839	" " " " Pocah. "	377	.19	.158	.160	.09
840	" " "(Sili. inc'd)" "	419	.23	.141	.150	.05
841	" " " " " " "	423	.23	.131	.146	.09
842	" " " " " " "	436	.23	.128	.141	.04

The table shows that a casting one inch square needs 2.75 per cent. of silicon to give it a shrinkage of .125, and that a half-inch square test bar from the same metal, will show a shrinkage of .135; but that a casting four inches square, on account of its slow cooling, needs only 1.25 per cent. of silicon to produce the same grain and shrinkage. The .165 shrinkage of the half-inch test bar shows that the iron will make a casting four inches square with a shrinkage of .125, and that it contains the correct amount of silicon.

The following experience, Series XV, during the present coal strike, is an illustration of the value of this relative test.

must be slightly decreased next day.

The Object in Producing these Examples is not to present new questions for discussion, but to show that the physical quality of cast iron is not wholly dependent upon its chemical composition, and that "Keep's Test" will not only always show the proper amount of silicon, but will show the influence of every condition met in foundry practice. Allow me in closing to again quote Mr. Mumford, "There has never been, and there hardly ever can be, a system of foundry testing so complete, and making it so certain that bars made now, or a year from now, in one shop or another, shall

be so absolutely alike, as 'Keep's Mechanical Analysis.'"

The above has come to hand while our paper is in press, and as it covers ground to which we have called attention on another page of this issue we give it space. THE FOUNDRY is the first to publish this matter in its present form.

It seems to us that if a founder will apply the information given in this paper to his own iron mixture, he will produce much more satisfactory castings.

The Art of Taking Casts.

Explaining the Substances Used: Plaster of Paris, Beeswax, Dough, Bread Crumbs, Glue, Etc.

BY S. BOLLAND.

IN order to obtain a cast from any of the above mentioned objects, the first operation is to procure a mold by surrounding the thing to be copied with some material which can be pressed into all the various parts of the figure. This will be the mold which, when it has become sufficiently hard, is to receive some substance, by pouring or otherwise, that will correctly fill all its parts and become when set an exact counterpart of the original figure. The manner of molding will always depend upon whatever is to be copied. Should there be no projecting parts, or cavities undercut, the method is simple enough, as it is only necessary to surround it with the mold-forming substance and withdraw the same direct.

SUBSTANCES USED FOR FORMING THE MOLD.

Plaster of Paris, wax, metal and other substances are used for this purpose according as the urgency of the case demands. Plaster of Paris prepared as described in the article, "Statue Founding," and brought to the consistency of cream, may be poured to any thickness required, always observing the precaution to oil well the object to prevent the plaster from adhering.

A very good mold, when it is required to use the same frequently, may be made from the wax mixture given in the article mentioned above; but in all cases where the position of the model is vertical or in any position liable to more than ordinary rough treatment, it is best to form the mold of modelers' clay, such as described in the article, "Pattern Modeling in Clay," page 189. This may be applied to the surface in sheets previously sprinkled with whiting to prevent sticking when it is to be removed.

BEESWAX, DOUGH, BREAD CRUMBS.

The above mentioned substances are excellent materials for taking impressions of small objects; especially are they serviceable when it is desired to make molds for seals and other things of a like nature. Should the relief show any marked irregularity of surface which would prevent its impression being taken clean and without fracture, then remedy this by filling the cavities, adding the same, with due consideration to the original, when the impression has been taken.

Any departure from a plane surface, such as cylindrical or other forms, must necessarily be divided into as many parts as will admit of a clean separation from the model, such parts to be afterwards joined together for casting. One way is to compress the clay well over all parts of the model in thickness sufficient to make a good, firm mold which, when it has hardened somewhat, is then divided with a suitable knife at such parts as will permit the several divisions to be easily withdrawn. Before lifting them away, draw lines or gutters at all the joints so that the closing together may be facilitated. After lifting away they must be allowed to dry, but care must be taken to keep them in proper shape. If proper care and judgment is used in choosing the places for dividing the mold, much labor may be saved and better work effected.

After the divisions have been dried, it only remains to oil the surfaces well and place them together again in proper order, with the hole upwards. The mold is then ready for the plaster, when the necessary binding together has been done. It is not necessary to make these

objects solid; if weight and cost of plaster is an object a core may be inserted and thus reduce the thickness as desired. Statuettes, figures, busts, etc., may, in similarly prepared molds, be cast of either bronze, zinc or lead, with this proviso, that under no circumstances must this be attempted if the mold be not absolutely dry; otherwise the steam rapidly generating will cause a sudden explosion which may endanger the lives of those near by.

TO TAKE A CAST IN METAL FROM ANY SMALL ANIMAL, INSECT, OR VEGETABLE.

After a box sufficiently capacious to hold the the object has been provided and well oiled in the inside, the animal must be suspended by a string or strings; the several parts of the animal or leaves of the vegetable must be adjusted to a natural position, and a piece of wood of suitable dimension to form a gate or runner must be attached to the body or main part of the object, and at all the extremities wires must be set so that a clear passage for metal or air may be secured throughout the whole mold. After these have been all properly secured to their respective places, a sufficient quantity of plaster and brick-dust in the proportions before explained, must be prepared and poured within in such a manner as not to disturb either the object to be cast or to remove any of the connections. A short time suffices for setting of this plaster, when the running stick and wires may be withdrawn and the box taken away, after which the mold must be subjected to a moderate heat for some time, gradually increasing the same until a red glow is obtained. This burns the object within to such a condition as to make the operation of cleaning out the ashes an easy matter. The passages provided for runners and vents serve to allow of blowing a current of air through the mold, and by this means freeing it of every vestige of the article placed therein and leaving behind a cavity which, when filled with metal, will answer to the form of the original. Sometimes it is somewhat tedious to extract all the ashes and much shaking and blowing with the bellows are required to effect a thorough cleansing; but if it be practicable to fill the mold with quicksilver the operation is measurably shortened, as the metal carries all the dust before it as it passes through and out at the runner and vents.

When the cast is of brass or copper, have the mold very hot, but a cooler mold will do for either lead or tin. Tap the mold gently as the metal is poured, and allow everything to become cold before extricating the casting, which latter operation requires great care when there are parts of more than ordinary fineness and delicacy. A little water will help to soften such parts of the mold as persist in adhering too strongly.

It may not always be convenient to obtain the fine-powdered brick-dust for this purpose, in which case Stourbridge clay, well washed and mixed with equal parts of the finest sand, will answer. Pounded pumice stone and sand in equal parts, to the same proportion of plaster of Paris, make very good molds.

TO TAKE A CAST IN PLASTER FROM A PERSON'S FACE.

When it is desired to take a cast of a person's face, the person must lie down on his back, his hair being previously so arranged as to prevent any of it interfering with the operation. A paper tube is then inserted into each nostril, so that the breathing may not be interfered with. Salad or some other pleasant oil must be applied to the face to make the separation easy. The plaster is then poured in small quantities at a time till the whole face has been covered to the required thickness, about one-fourth to three-eights of an inch being a sufficient quantity if the operation is smartly performed. But a short time is required for the plaster to set, and it may be removed at once and used for a mold in which to form a clay head, at the same time rectifying the closed eyes and otherwise perfecting the clay model. This model is now used to obtain another cast in plaster in as many parts as are necessary to affect a clean withdrawal, which, when oiled and placed together again, form the final mold for the plaster cast, which must inevitably be a fac-simile of the person's face.

TO TAKE CASTS FROM MEDALS.

Either plaster of Paris or melted sulphur will answer for this purpose. First, oil the medal with a brush dipped in olive oil, and after surrounding the medal with a strip of paper, cut to the depth of the required mold, brush the surface of the medal over with a little plaster made to the consistency of cream, and then fill up the rest. The idea of brushing a small quantity all over the surface before filling in the rest is to make sure that the air is all expelled from the surface, and thus prevent bubbles forming there. After it has set hard, remove, and allow it to dry; a fire will be necessary if the weather is cold or damp. If the object operated upon after this manner is more than ordinarily large, use fine plaster on the surface, and a rougher and cheaper kind to fill in with.

If hot sulphur is poured upon silver medals they will tarnish very badly.

When a mold, after being cast as above described, is to be used for a sulphur cast, let it be prepared as follows: Mix in a bottle one ounce of oil of turpentine with one-half pint of boiled linseed oil. After well shaking this mixture, subject the mold to repeated dipping until it has absorbed all the oil it can contain, when, if it is kept in a dry place for a few days, its surface will have become very hard and fit to cast sulphnr thereon. Whether the cast be sulphur or plaster which is taken from this mold, a similar process to the one adopted for obtaining the mold may be followed, not neglecting to oil the mold, excepting that in the case of sulphur a ladle will be required for melting.

TO TAKE CASTS WITH ISINGLASS.

Isinglass dissolved with water at a gentle heat is all that is required for this purpose. The solution ready must be carefully brushed with a fine brush over the surface of the medal and then allowed to dry. As soon as it is hard it may be raised from the surface, and upon examination a most beautiful impress of the medal will be found.

Any color may be imparted to the cast by adding coloring to the solution, and if desired, the appearance of gold may be imparted by laying a little gold leaf on the rough side.

ELASTIC MOLDS.

Molds may be made elastic for plaster of Paris casts which have more or less undercarving of the model. Take 8 parts glue, 4 parts molasses, mix and boil together, and to this add 1 part of boiled linseed oil gradually stirred in. This mixture must be cast over the model while hot; when cold it may be easily removed and prepared by oiling for the plaster cast, which when set can be removed without damage, as the undercut parts being elastic recover their original position again.

Niagara Falls Excursion

Via the C., H. & D. R. R.

Under agreement of the Trunk Lines, it was decided that no Niagara Falls cheap excursions would be run this year until after the first of August. The Cincinnati, Hamilton & Dayton Railroad will run one of their famous excursions to Niagara Falls at the usual low rate, sometime about the first or second week in August. These excursions were discontinued last year owing to the World's Fair, and it is expected that they will be larger than ever this year. Look out for the announcement of them in this paper.

NOTICE.

Advertisements inserted under this head for 25 cents a line each insertion.

WANTED—A good practical foundryman with some capital to invest in an established business as partner. Other partner engaged in boiler-making business that uses a great many castings. John T. this office.

FOR SALE.—Foundry, jobbing and repair shop; in a lively, growing city with a good country. Address, Wm. Engbring, Cedarburg, Wis.

WANTED—A patternmaker about 30 years old; fair experience, with $500 to $1,000 as partner in a foundry in St. Louis, Mo. Write J. Mac. Cash, 619 Harris Ave., St. Louis, Mo.

WANTED—First-class loam molder for heavy marine engine work. Address S. J. W., this office.

FOREMAN WANTED—For foundry making cast iron water pipe; must understand the business in all its details, and be able to handle men economically. Give experience and reference. Address W. F. L. care "The Foundry."

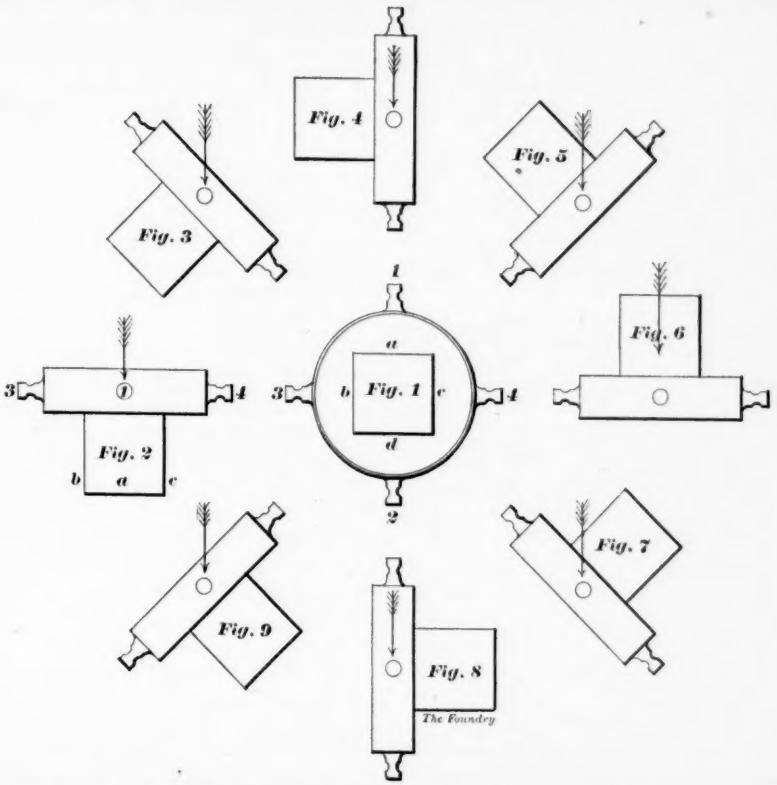
FOUNDRY FOR RENT—Fully equipped, new, well advertised, good location, the only one in a rich Western State; is offered at a very moderate rental; a rare chance for a party wishing to engage in the stove or general founding. Write F. S., this office.

"Dropped."

BY H. HANSEN.

THIS little word is when uttered, a sound of consternation to the molders whose work is dropping. Hardly another word in the English language can change the features of the Knight of the Rammer so suddenly as this one. A few may appear unaffected, as if their mold dropping out was something that did not concern them, but where is the molder who, deep, deep down in his heart does not abhor a drop? Aside from the fact that the foreman is liable to pass an opinion on his artistic ability in anything but complimentary terms, he knows that his shopmates are making a memorandum of his shortcomings and that if he should ever undertake to pass judgment upon any of their faults he would be consronted with his own "skeleton in the closet" which would be brought to daylight in short order.

My belief is that one reason so many molders become "hoboes" can be accounted for in the fact that they cannot bear the sight of their own "ghosts"; they cannot live them down in the place they appear. (What I mean by molders' "ghosts" is the bad breaks or mishaps, whatever we call them, that a molder runs against in this life.) In fact the greatest monument some of the best molders have, and poor ones too, for that matter, both before and after death, is some such occurrence as a "blow-up," a "run-out," a "drop-out," or any similar accident, which for its magnitude has not before been seen in the place it happens.



I remember once overhearing two old foundry helpers (they are about the only ones that become old in one shop and therefore have the largest stock of information concerning its former inhabitants) telling each other about some narrow escapes they had from being burned, one relating how he was carrying iron one dark night, when he fell in

a pit, how he felt after the iron struck the wet clay at the bottom and made him look like a large pepper box, etc. His partner had to relate something, and asked: "Do you remember the night that Andy Hicks' big cylinder mold blowed up at the old shop up town? That was a terror; it was just up nice when it all went to the roof and came down on all of us," etc. "Where is Andy now?" asked the first one. "He has been dead twenty years," was the answer.

Here then is the only thing that keeps poor Andy's memory green, "The bad job he made." All his good work is forgotten and being duplicated by others, but not so his blow-up; that stands pre-eminent. Nobody has approached it in grandeur, and it will not be forgotten till some modern genius has a wreck that will eclipse it.

A molder often puts on his coat and bids farewell to familiar scenes through such accidents, and goes to seek new fields, where nobody knows his former troubles. Here, as long as everything runs smooth with him, all the odds are in his favor, he can discuss others mishaps, but his own he will keep to himself. It is only a question of time, however, when something will happen to him that will make him liable to the criticism of others, when he must pay the fiddler himself or "hit the road" to try his experience over again.

If a molder has drop-outs periodically a change of climate will not cure the evil, nor benefit the patient, other conditions being the same. Every molder has drop-outs, some but very few. Next to ramming a mold properly, securing can be considered one of the greatest difficulties the molder has to contend with, as it is almost impossible to continually have an imprint on our mind of the different positions a mold will occupy in being handled, and unless we have this, we are likely at any time to be victims of the drop-out.

Some say when a drop happens, "That mold was not secured." I would add "against the strain imposed upon it in the position it occupied when the drop-out occurred."

Nearly all drops take place while a mold is being handled, and just watch and you will agree with me that nine out of ten happens while the mold is in a different position to that in which it was rammed up. It is in turning over that we have the greatest trouble.

To make this theory plainer I will show Fig. 1, being the plan of a circular cope having trunnions, 1, 2, 3, 4, whereby we can turn it in the direction we desire. Fig. 2 shows the position in which such a cope would be rammed up. We will also presume that we have a body of sand (a pocket, to use molders' language), a, b, c, d, to lift in addition to the sand in the plain cope. But few will differ with me in the opinion that the securing which would be sufficient to lift this extra body of sand in its place at Fig 2, would be entirely inadequate at Figs. 4 and 8, in which places the cope occupies positions at right angles to that in which it was rammed up. At each of the other figures shown the cope in being turned over changes to different positions, and the direction of stress, due to gravitation, does, as indicated by arrows, change in each case.

In the preceding figures the flask turns on trunnions, 1, 2; by turning on 3, 4 we have another number of positions (not shown) in which, with the exception of two similar to Figs. 2 and 6, the stress will issue from different points.

When we consider how fragile a material sand is, we cannot help but wonder, when looking at some large mold with its hanging bodies of sand, at the foresight required to properly execute and furnish a "skeleton" (as we may properly call the rigging used in securing), which shall stand, not only against the forces originating within itself in all positions it may need to be placed, but also against pressures and stresses having their source in the metal.

If foundrymen expect to get molders who will never have a drop-out they must look for some in the coming generation who possess the great faculties some of our modern mediums claim to have. But there is hardly an individual who is the seventh son of a seventh son and born with a veil, who would sacrifice his opportunities in the foundry.

The work is far too hard and the pay too small for people with such wonderful powers. As long as every day mortal beings are the only ones who learn the molders' trade, drop-outs will come, but the number of such can be greatly decreased by training our minds to retain an impression of a few of the principle positions a mold is compelled to pass through in handling.

Lessons in Patternmaking for Manual Training Schools.

BY P. S. DINGEY.

V.

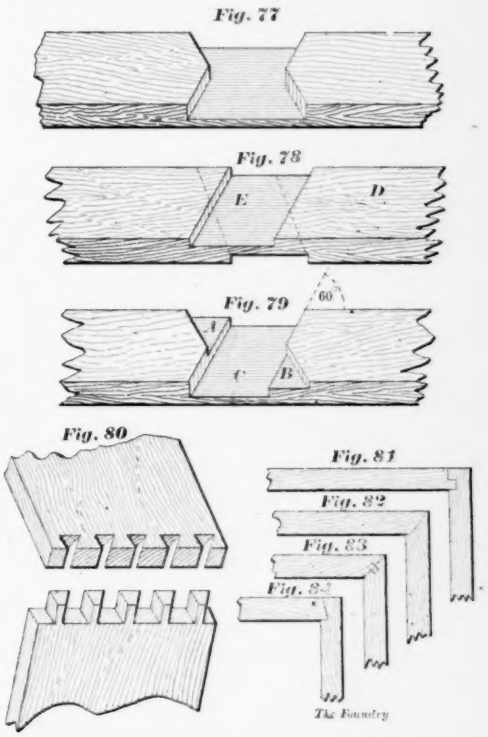
CHECKING TOGETHER SIX ARMS.

THE way in which two pieces of wood are half checked together at right angles to each other, was given in Fig. 11, in the first of these articles on patternmaking. In the present one a step forward is made, but on the same line by checking together three pieces in the middle, bringing them all flush with each other, and when together forming six arms.

The three pieces are shown in Figs. 77, 78 and 79, broken at the ends. Let the student imagine each piece about 4 feet long, 6 inches wide and 1⅝ inches thick. The checking is shown in perspective in order to represent clearly the manner of cutting the pieces.

After dressing the stuff to required thickness and width, make a line with a gauge up the center of each piece lengthwise on both sides, and strike a circle in the middle on one side of each piece in Figs. 77 and 79, and on both sides of the one in Fig. 78. The diameter of this circle should be the same as the width of arms. Now set a bend at an angle of 60°, and with it lay off two parallel lines tangent to the circle, reverse the level and lay off two other lines on the same side which will cross the first ones at the center—only Figs. 77 and 79 are laid off in this manner. Fig. 78 is marked in a similar way, except that instead of the four lines on one side, two on each side are made as shown by dotted lines.

The gauge is now set to one-third of the thickness, which is ⅝", and gauge marks made along the edge of arms. Figs. 78 and 79 are gauged from both sides, and Fig. 77 only from one. In the first process of checking, only one-third of the thickness is taken out in order to get steps A and B in the same plane as E, after which C should be cut down leaving one-third of thickness on



Checking together for six Arms and Box Making

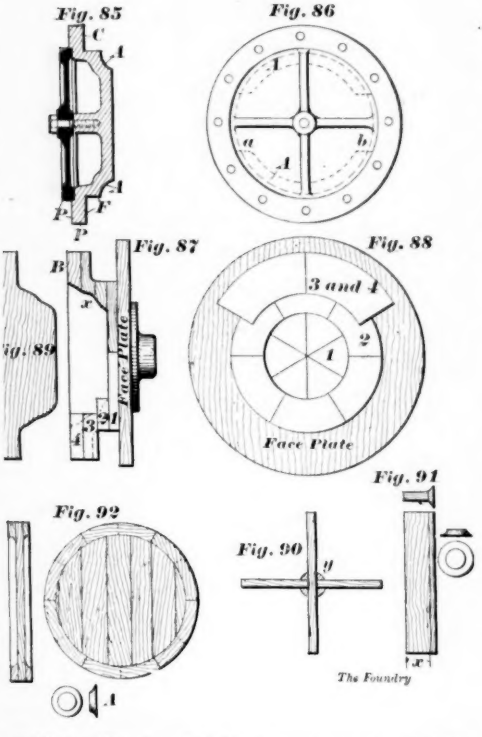
the back. In Fig. 78 one-third is taken out from each side, leaving one-third in the middle—in Fig. 77, two-thirds from one side, leaving one-third on the back.

Now, if these three pieces have been accurately cut as described, Fig. 78 will fit into Fig. 79 by moving around end D, at an angle of 60° with Fig. 79, as marked, and Fig. 77 will fill the remaining space, bringing the three arms flush with each other. Before gluing together care should be taken that the pieces do not fit so tightly as to distort the arms.

BOX MAKING.

The methods for joining corners for boxes, etc., are numerous, and very little will be said here on this subject.

The illustrations in Figs. 80 to 84 clearly represent four different ways and need no explanation. The dovetailing in Fig. 80 is the strongest, and perhaps for this reason, is the one most generally adopted. Patternmakers' and machinists tool boxes, for instance, are usually dovetailed together in this manner. For smaller boxes Figs. 81 to 84 are used. Of the four examples shown, Figs. 82 and 83 make the neatest corner joint, because the end grain of the wood



Cylinder Head and False Cover for Corliss Engine

is hidden. Each of these corner joints can be easily made with the combination circular saws now in the market, but it will be good practice for the beginner to make these corner joints with the bench tools, as well as the dovetailing in Fig. 80.

CYLINDER HEAD AND FALSE COVER FOR CORLISS ENGINE.

Figs. 85 and 86 are two views of a cylinder head and cover for a Corliss engine, Fig. 85 being a section of the head with cover in place. This head can also be used for a slide valve engine by filling up on the pattern one of the spaces (A) shown by dotted lines in Fig. 86.

It may seem unnecessary to say that only well seasoned and select lumber should be used in these two patterns, but however needless it may appear it is safe to say that wherever machinery is built, much money is unnecessarily sunk by not putting selected and well seasoned lumber in patterns. The evil consequences of this not only increase the pattern account of a firm, but add considerably to the cost of molding and also to the finishing of castings in the machine shop, for a pattern that is warped out of its original shape by using wet lumber, will give the molder trouble in molding, and the casting being like the pattern, will also cause the machinist trouble, increasing thereby the cost of production all around, and all because the patternmaker was not careful enough in selecting the lumber. This statement may appear to be exaggerated, but there are many with experience who will recognize in the above the cause of the old complaint, "That pattern ought to be fixed."

Having seen the importance of selecting dry lumber, proceed to build the pattern of the cylinder head, as shown in Figs. 87 and 88, remembering to allow stock for turning where marked F and P, in Fig. 85. F designates the part of casting which is to be finished, and P for polish.

A full size section of the head should be first drawn in order to know the thickness of courses and number needed, as shown in Figs. 87 and 88—this will also give the width of courses 1, 2, 3 and 4. After planing the lumber to an even thickness and sawing out the segments for each course, as shown, prepare a face plate on which screw the lathe face plate, and when faced off lay up the courses, facing off each in the

lathe to insure perfect joints, as shown in Fig. 88. For this and similar work a trimmer should be used for cutting the ends of segments.

All the courses being built up, cut out a templet as shown in Fig. 89, about $\frac{1}{8}$" thick the shape and diameter at X, then turn out the pattern at X to templet—the small step that receives the cover should not be turned in the pattern; the machinist will turn out that part in the casting.

The pattern should now be taken off the face plate, and the face B screwed to face plate for turning the inside of the head at A and C. It will be seen by dotted lines in Fig. 86, that after turning out the pattern at A, it is partly filled in again on opposite sides, making A on each side from A to B, to coincide with port opening in the cylinder for which the head is made.

The pattern being turned, prepare the ribs by half checking two pieces together, as shown in Fig. 90. These two pieces should be planed to a little taper and the width of X in Fig. 91. Instead of gluing the fillets into the corners after the ribs are fastened in place, a better plan is to glue them on as represented by end view, also turn a small boss with fillet for the center, the diameter being same as that at Y in Fig. 90. Before half checking the two pieces together it may be better to cut roughly the ends to templet in Fig. 89, in which case care must be taken to half check the pieces exactly in the center, so that when the ribs are located as in Figs. 85 and 86 the small boss will be concentric with the head.

The pattern for the false cover of the head is made as represented in the two views, Fig. 92. The plate is made in strips to prevent it from warping, and the joints should not be glued. It is held together by two courses of segments, one on each side as seen in section. Two small bosses, as at A, are turned and located in center of plate.

How a Trade Paper Helps.

A SUCCESSFUL manufacturer, says an exchange, when asked why he patronized trade papers so largely to the neglect of other methods of advertising, replied: "Men who do not read their trade papers and keep posted in their business are usually poor customers. If I sell them a good lot of machinery they do not know how to use it, and report it a failure, or we have to run after them, lose time and money to get them agoing, and make the sale stick. But those who read and are posted know how and succeed. Such men would not read circulars if I were to mail circulars to them. They see my "ad." regularly in the trade paper, and know I have an established business, and when they want anything in my line, write me and don't whine about price or what time they can get from others, buy, try, and have no trouble, and pay the bill. Give me such a class of customers as I get by such judicious advertising all the time." His experience is that of successful merchants. The trade paper keeps its readers in touch with the times; with the currents of trade and commerce; it puts money in his pocket in many ways. It is a preventive against sloth and rust. It helps to develop the best side of a man's commercial life.

Western Foundrymen's Association.

THE annual meeting of the Western Foundrymen's Association was held in the Western Union Building in Chicago, May 2, last.

The secretary read a letter from the president, George M. Sargent, regretting that he could not be present and congratulating the association on its work.

The treasurer's report was read showing $455.00 received and $448.14 paid out, leaving a balance on hand of $6.86, with outstanding assets of $160.00, and unpaid bills amounting to $131.00.

The secretary's report, which gave a brief review of the association since its organization up to date, together with the previous reports, was placed on file, and the various officers, especially the secretary, received a vote of thanks on behalf of the members of the association for the work they had done.

A nominating committee was appointed to nominate officers to serve for

the ensuing year, and reported in favor of the following gentlemen, all of whom were unanimously elected:

President, George M. Sargent; vice-president, C. A. Sercomb; secretary, B. M. Gardner; treasurer, H. S. Vrooman; executive committee—J. M. Sweeney, W. N. Moore, O. T. Stantial, E. C. Greenlee, H. L. Hollis.

A paper was read from F. B. Whitcomb on the subject of cupolas and brought out a lengthy and very interesting discussion, and also a paper by Mr. H. L. Hollis, on the chemical differences of some Russian, German and American castings, which was interesting as it contained a table showing the comparative results obtained from a chemical analysis of all of them.

Books, Exchanges, Catalogues, Etc.

THE printers' art coupled with some commendable enterprise on the part of manufacturers, dealers, etc', has been responsible for some very fine work in the way of handsome catalogues during the past year or two, but we think that for a distinctly original and artistic production in the way of a catalogue devoted to the interest of the fire-brick molding sand and foundry supply trade, the Garden City Sand Co., of Chicago, Ill., should go to the head of the class with their new catalogue just issued. The illustrations are of the half-tone variety from special designs and their being printed in colored ink on fine paper gives them an exceptionally rich appearance. The catalogue contains also much valuable and statistical information that is of service occasionally in every foundry.

Brown Bros., of Chicago, Ill., whose advertisement appears elsewhere, have published a very complete little catalogue illustrating the many designs of vault and floor lights, coal-hole covers, ventilating grates, etc., manufactured by them.

Those who have read Mr. G. P. Serviss' "Astronomy with an Opera Glass" will welcome a series of illustrated articles by the same author, which will begin in the June *Popular Science Monthly*. "Pleasures of the Telescope" is the general title of the series, and the first article deals with the selection and testing of a glass suitable for an amateur. The difference between a reflecting and a refracting telescope is also very simply explained.

"One of the most intersting characteristics in Samoan life is the *taupou*—great lady—of the village, who is the virgin daughter of the ruling chief. If he has no daughter, he may adopt one from some branch of the family, the selection being made by the women of the village. On being raised to this dignity, the maid, as she is called, leaves her father's house and occupies the *faletele*—great house—surrounded by young girls who are the cast-off mistresses of the 'flash chiefs.' Here she holds her court, commanding in a social way the entire village. Here also she entertains traveling parties, who are always at liberty to occupy the *faletele* in any village at which they may stay over night. She is supposed to have an eye to their wants, but visitors usually bring food and do their own cooking. Supported by the boys, girls and children of the village, she heads a procession dressed in their finest wearing apparel. Each one carries in the hand some article of food which is placed on the ground before the guest house. It might be well to state for the benefit of the fair sex in other countries who object to kitchen drudgery, that the greater proportion of the cooking in Samoa is done by the men."—From "The Land of the Breadfruit," *Outing* for June.

The National Car Wheel Co., at Buffalo, N. Y., write us that they do not at present contemplate adding a foundry to their plant, and the statement in THE FOUNDRY to the effect that they did, was in error.

Tweedvale is the name of a new Cincinnati suburb, nine miles from the latter city, on the C., H. & D. R. R. The consolidation of the Laidlaw, Dunn & Gordon Pump Companies necessitated the erection of a plant where all could be brought together, and a new town has been founded with that name, and the works are being rapidly pushed to completion.